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DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ARMY'S LAND ACQUISITION PROJECT FOR THE NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA, AND PROPOSED AMENDMENT TO THE CALIFORNIA DESERT CONSERVATION AREA PLAN



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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Lead Agency

U.S. DEPARTMENT OF THE ARMY
FORCES COMMAND
NATIONAL TRAINING CENTER, FORT IRWIN
Cooperating Agency

U.S. DEPARTMENT OF THE AIR FORCE
EDWARDS AIR FORCE BASE
Cooperating Agency

Prepared by:

U.S. ARMY CORP OF ENGINEERS
LOS ANGELES DISTRICT

with

CHAMBERS GROUP, INC.
and
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DECEMBER 1996

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DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED NATIONAL TRAINING CENTER LAND ACQUISITION PROJECT

(X) DRAFT () FINAL

Lead Agency	U.S. Department of the Interior Bureau of Land Management California Desert District
Cooperating Agencies	U.S. Department of the Army Forces Command National Training Center
	U.S. Department of the Air Force Edwards Air Force Base

This Environmental Impact Statement (EIS) addresses the proposed withdrawal of approximately 310,296 acres of public lands from entry under public lands laws to support the training mission of the U.S. Army National Training Center (NTC) at Fort Irwin, California. The public lands are currently managed by the Department of Interior, Bureau of Land Management (BLM). Approximately 20,921 acres of intermingled state and private lands would be acquired. Withdrawn and acquired lands would be for the exclusive military use for force-on-force training of armored and mechanized brigades. Significant impacts on public access, soil, air quality, biological resources, cultural resources, land use, wilderness quality, and transportation are analyzed in this EIS.

Ed Hastey

State Director
California State Office

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ENVIRONMENTAL IMPACT STATEMENT ORGANIZATION

DOCUMENT OVERVIEW

This Draft Environmental Impact Statement (DEIS) addresses the potential environmental effects associated with the proposed acquisition of lands to support the training mission of the U.S. Army National Training Center at Fort Irwin, California.

The EXECUTIVE SUMMARY briefly describes the proposed and alternative actions, potential environmental impacts and mitigation measures, relevant areas of controversy and issues, and compliance with federal statutes, regulations, and guidelines.

Section 1 INTRODUCTION, summarizes the background of this proposed land acquisition and describes the environmental impact analysis process.

Section 2 ALTERNATIVES, describes the Proposed Action and alternatives that were developed to achieve the objectives associated with the proposed acquisition.

Section 3 AFFECTED ENVIRONMENT, presents the environmental setting of the study area without the proposed land acquisition.

Section 4 ENVIRONMENTAL IMPACT ANALYSIS, covers the potential direct environmental effects of the land acquisition proposed and describes planned mitigation actions.

Section 5 RELATIONSHIP BETWEEN SHORT-TERM USES OF ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY, describes how the Proposed Action will involve tradeoffs between long-term productivity and short-term uses of the environment.

Section 6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES, describes the commitment of resources for implementation of the Proposed Action.

Section 7 CONSULTATION AND COORDINATION, provides a description of public participation opportunities, public agencies consulted, and distribution list.

Section 8 RELATIONSHIP TO RELEVANT ENVIRONMENTAL PROTECTION STATUTES AND OTHER REQUIREMENTS.

Section 9 LIST OF PREPARERS, identifies the people who prepared the report and their disciplines.

Section 10 INFORMATION CONTACTS AND BIBLIOGRAPHY, provides a list of people and agencies who provided information to the preparers of this report, and provides full bibliographical information for sources cited in the text of the report.

Section 11 ACRONYMS AND ABBREVIATIONS

Section 12 INDEX

Appendix A	Land Use and Requirements Study
Appendix B	Revised Final Draft Tortoise Biological Assessment and Conservation Plan
Appendix C	U.S. Fish and Wildlife Service Biological Opinion on the Proposed Action
Appendix D	Plant Species List for the Study Area
Appendix E	General Air Conformity Requirements Study

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ARMY'S LAND ACQUISITION PROJECT FOR THE NATIONAL TRAINING CENTER FORT IRWIN, CALIFORNIA

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

ES.1.1 Purpose and Need

This Draft Environmental Impact Statement (DEIS) addresses the potential environmental effects associated with the proposed acquisition of lands to support the training mission of the U.S. Army National Training Center (NTC) at Fort Irwin, California. The purpose of the Proposed Action is to provide sufficient area to support the NTC. The NTC's primary mission is to train soldiers in a realistic combat situation using the modern U.S. war fighting doctrine known as Joint Operations. The current lands at the NTC are not adequate to realistically support the NTC's training of brigade-sized units because of the increasing sophistication and speed of modern weapons that require greater time and distance factors.

A Land Use Requirements Study (LURS) prepared in 1985 determined that an addition of 238,000 net maneuverable acres (defined as areas with a 20-percent or less slope) to the NTC was required to fully meet training needs. A subsequent LURS, prepared in 1993, reaffirmed the land requirements at 222,000 acres. The Proposed Action involves the acquisition of approximately 331,217 acres, including 277,244 net maneuverable acres, within the Silurian Valley area adjacent to the NTC that will reduce the shortfalls and deficiencies and expand the training capabilities of the facility.

This DEIS analyzes the potential environmental effects of the Proposed Action and alternatives in order to provide information to decision-makers and the public for review and comment.

ES.1.2 Lead and Cooperating Agencies

The Proposed Action and alternative areas for acquisition to expand the NTC are primarily administered by the Department of Interior, Bureau of Land Management (BLM). The BLM is the Lead Agency under the National Environmental Policy Act (NEPA). The U.S. Army Corps of Engineers is the Proponent of the Proposed Action as the land agent for the Department of the Army. Because some alternatives involve airspace under the jurisdiction of the U.S. Air Force (USAF), that agency is a Cooperating Agency.

Under the Engle Act (February 28, 1958; 43 USC 155-158), withdrawals of over 5,000 acres require congressional approval. Recommendations from the BLM and the U.S. Army will be presented to the Secretary of the Interior and, after coordination with the Secretary of Defense, Office of Management and Budget, and the President, a final recommendation will be made to Congress. Congressional action to implement the proposed expansion of Fort Irwin would withdraw affected public lands from public use and implement an amendment to the BLM California Desert Conservation Area Plan.

ES.1.3 Location

Fort Irwin consists of approximately 642,000 acres in San Bernardino County near Barstow, California. Figure ES-1 presents the location of NTC and the study area encompassing the area of various acquisition alternatives in regional perspective.

ES.1.4 Background

Fort Irwin has been used for antiaircraft, armored, and mechanized training for regular Army and National Guard units since 1940. Fort Irwin was designated as the NTC for the U.S. Army in 1981. The NTC provides the critical edge in training brigade-level units in highly realistic combat situations. This facility is unique in the world and played a major role in the development of tactics and the training of soldiers in the AirLand battle tactics used successfully in Operation Desert Storm.

Current maneuver space is inadequate primarily due to modern tactics and doctrine. The modern U.S. war fighting doctrine, known as Joint Operations, is influenced by forces and potential adversaries. The static front lines of World War II and Korea have given way to the fluid 100-mile-deep rear, main, and forward battle areas of the Persian Gulf. From training at the NTC and experiences in Operation

Desert Storm, the Army realizes that future battlefields will be controlled by commanders who have at their disposal a wide variety of highly mobile ground and air platforms. The training of those commanders and their units must be conducted at doctrinally correct distances to replicate the field conditions under which military personnel actually operate.

Modern U.S. forces conduct Joint Operations over vast areas using an ever-improving array of vehicles, weapons, and equipment. For example, the M1A1 battle tank can, while moving at 40 miles per hour, accurately hit targets over 1½ miles away. Apache helicopters can accurately engage targets at a distance of over 9 miles. The Multiple Launch Rocket System can hit targets over 60 miles away. Modern communication equipment allows commanders to simultaneously command and control all subordinate elements throughout the full range of the modern battlefield. As the vehicles, equipment, and weapons of the Army and its potential adversaries improve, the modern battlefield will become evermore fluid. Thus, acquisition of additional land to permit the kind of dispersed field training likely to be required in future warfare is essential.

The lessons learned from training at doctrinally correct distances likely to be confronted in future combat are crucial to successfully accomplishing the Army's mission. More acreage is needed so that (1) reconnaissance units can learn to patrol realistic distances and detect realistically dispersed enemy units, (2) logisticians can learn to supply combat units from realistically distant supply bases, and (3) commanders at all levels can learn to field and control realistically dispersed units.

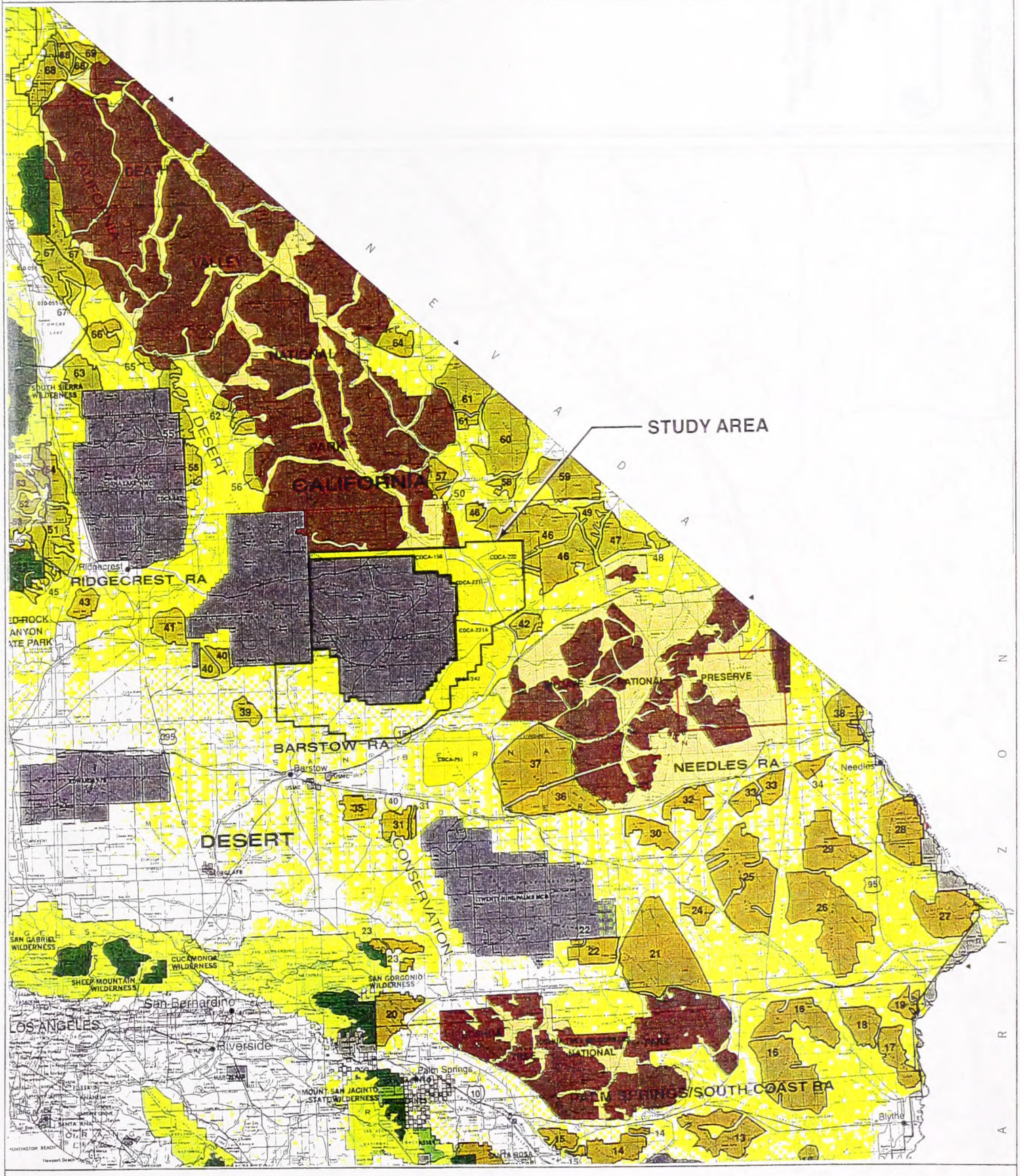
Other factors have constrained or reduced the area available for training maneuvers since Fort Irwin's boundaries were established for an antiaircraft training base. In 1940, approximately 642,000 acres were set aside exclusively for military training exercises. Today, however, the NTC is a joint-use, multipurpose facility with more than 33,000 acres dedicated to the National Aeronautics and Space Administration's Goldstone Deep Space Communication Complex and satellite tracking facility. In addition, almost 93,000 acres are dedicated for USAF live-fire bombing operations with another 188,000 acres set aside for buffer zones, environmentally sensitive habitat, archaeological sites, and inaccessible, steeply sloping mountain ranges. In total, more than 314,000 acres within the 1940 boundaries of Fort Irwin are not available for present and future training needs.

The NTC first proposed the acquisition of additional training lands in 1988 to meet its training requirements. The initial Proposed Action was to acquire lands south and west of the NTC. Detailed environmental analysis coupled with the listing of the desert tortoise as a threatened species changed the initial proposal to acquiring 331,217 acres in the Silurian Valley east and southeast of the NTC.

ES.2 DESCRIPTION AND ANALYSIS OF ALTERNATIVES CONSIDERED IN DETAIL

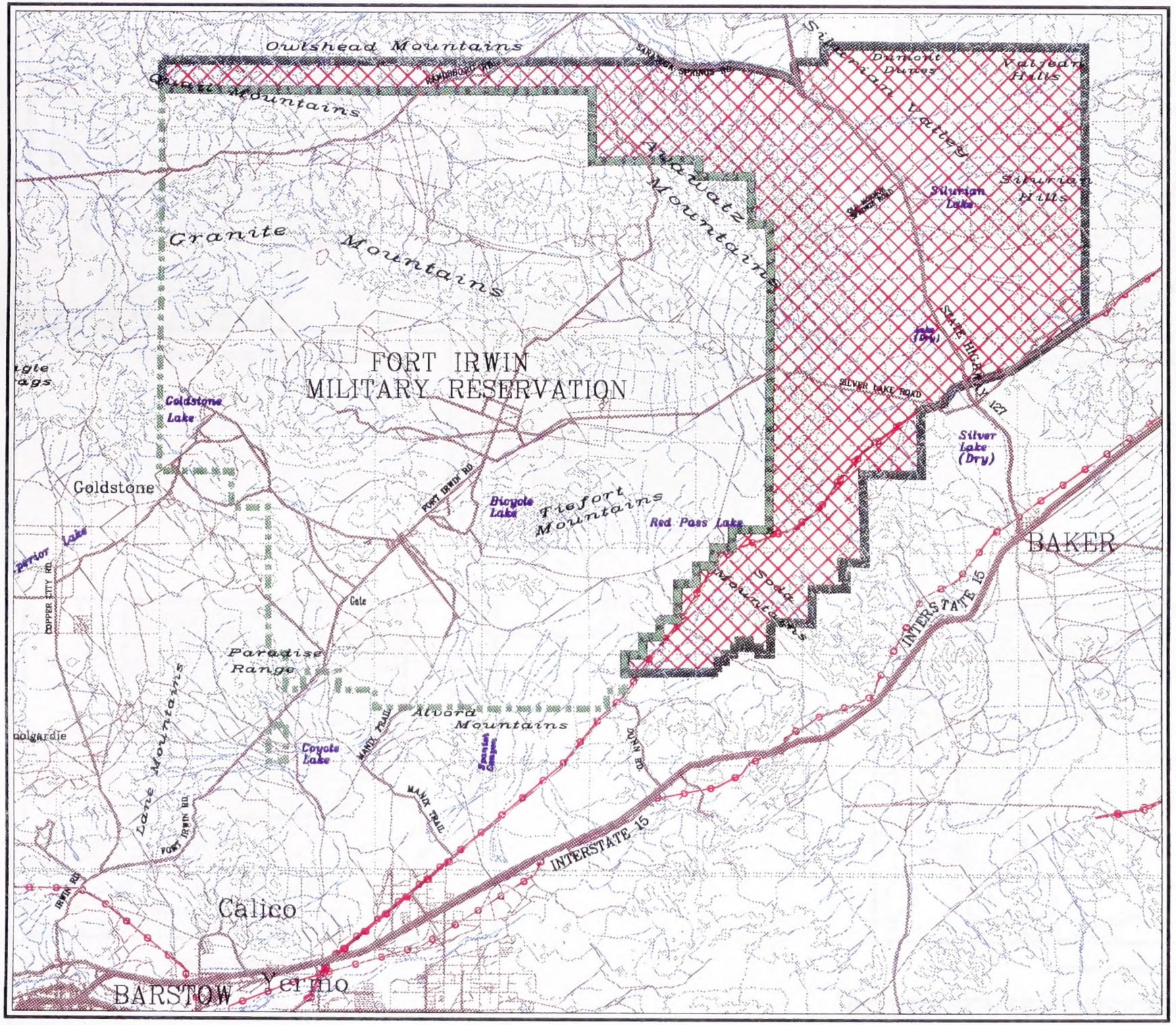
The Proposed Action, No Action Alternative, and five additional alternatives have been analyzed in detail in this DEIS. Figures ES-2 and ES-3 illustrate the configurations of the Proposed Action and the five acquisition alternatives.

With the exception of the No Action Alternative, each acquisition alternative would result in the land being withdrawn from the public lands administered by the BLM and used primarily for military purposes. Training will be intensive force-on-force realistic combat in which combat units come to the NTC for 28-day rotations and train against units permanently stationed at the NTC. In all but the Proposed Action, Modified Avawatz-Silurian, and No Action Alternatives, there will be extensive operation of tracked and wheeled vehicles throughout the acquisition area, with the vast majority of activity occurring in areas of 20 percent or less slope. There will also be digging of tank and gun emplacements as well as establishment of basecamps and staging areas. No live fire will be conducted on acquisition areas, although there will be simulated fire from tanks and other vehicles, as well as extensive use of helicopters. Units will be self-contained and will not require drilling of wells or construction of utilities on acquisition areas. For the Proposed Action and Modified Avawatz-Silurian Alternatives, the operation of tracked and wheeled vehicles will be restricted to roads and areas below 20-percent slope. Staging areas and basecamps would be established in the Proposed Action and Modified Avawatz-Silurian Alternatives. There would be no force-on-force maneuvers within either of these alternatives.



N Not to Scale

REGIONAL MAP: NATIONAL TRAINING CENTER AND THE STUDY AREA
Figure ES-1



Explanation

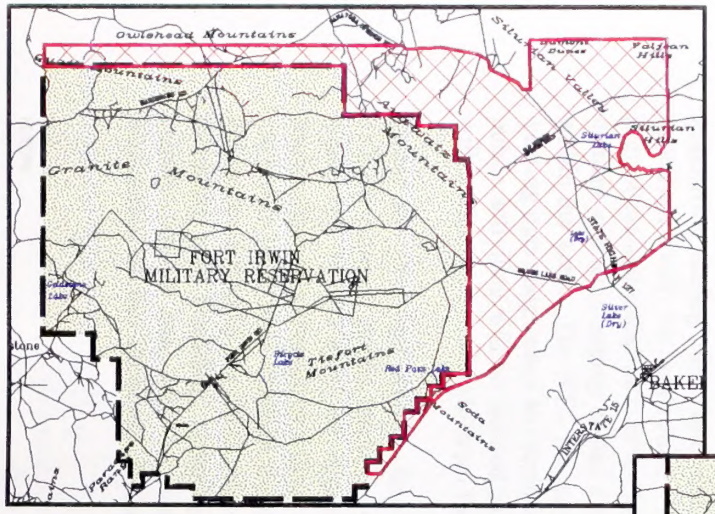
- Proposed Action
- Power and Transmission Lines

Final Consideration
PROPOSED ACTION
(Silurian Valley Alternative)

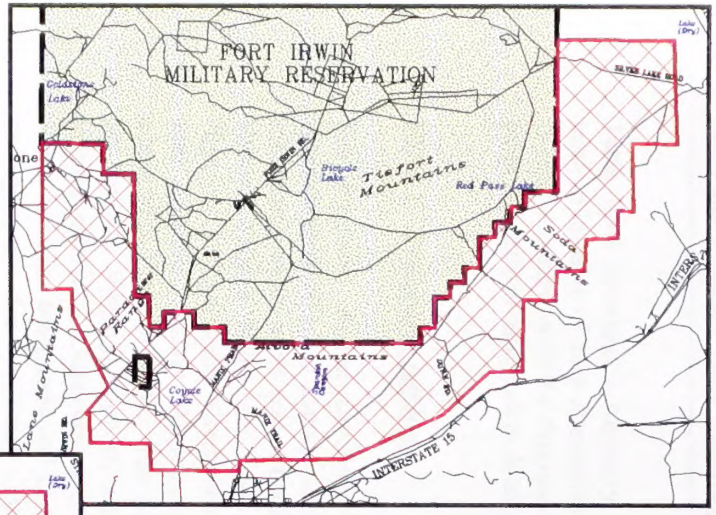
Figure ES-2

Chambers Group, Inc.
Project# 6347
MAP SCALE 1" = 40000'
5 2.5 1.25 0 5 Miles

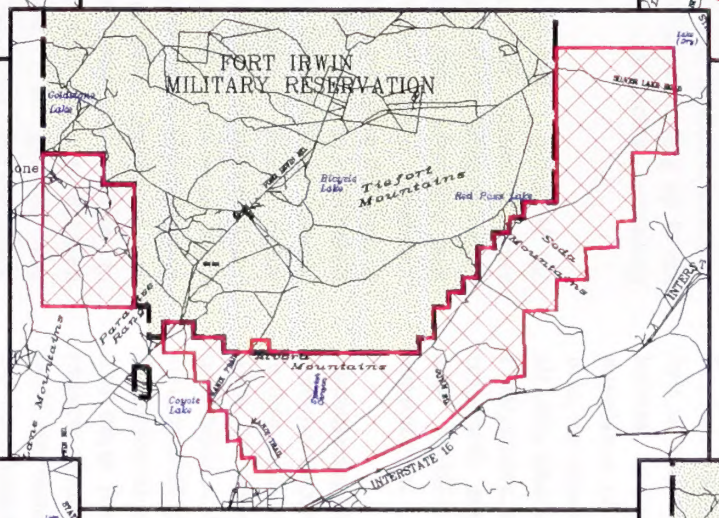
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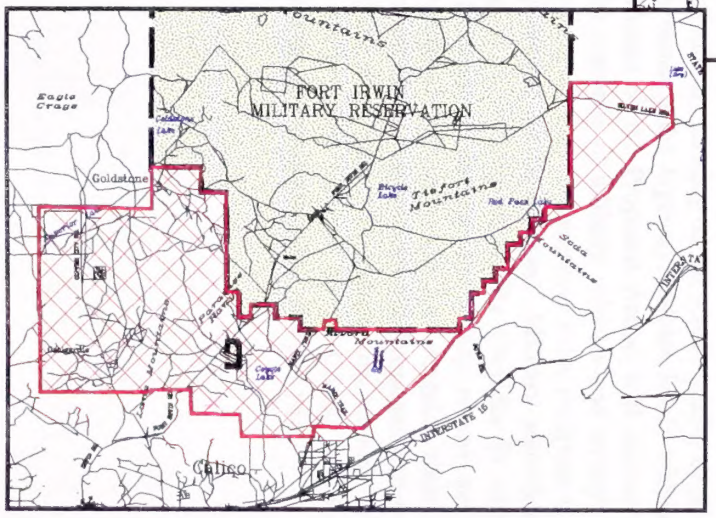
Modified Avawatz-Silurian Alternative



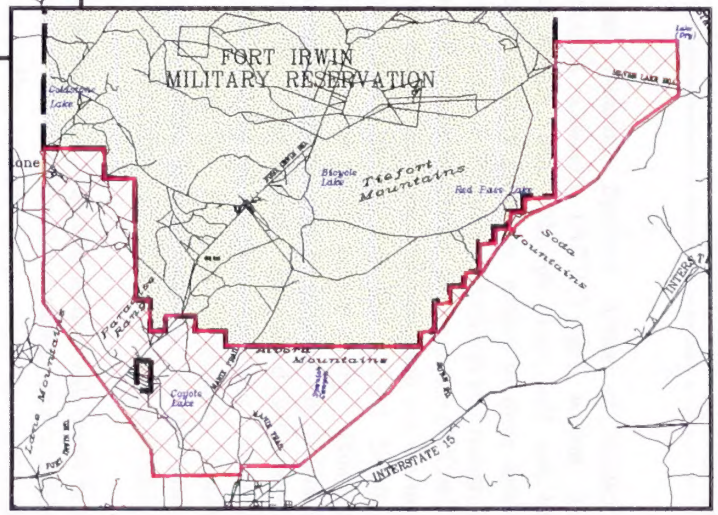
Modified Coyote Basin Alternative



Alvord Alternative



Superior Valley Alternative



Avawatz Alternative

ALTERNATIVES CONSIDERED IN DETAIL

Figure ES-3

plot/plots/80347_fitrwin/plots/plot_many_alts.ami
Project 80347

Table ES-1 provides a summary comparison of the relative impacts of each alternative analyzed in detail. A brief description of the Proposed Action, as well as other alternatives analyzed in detail, is provided below.

ES.2.1 Proposed Action

The Proposed Action involves the acquisition of approximately 331,217 acres yielding 277,244 acres of net maneuverable acres east of the NTC in the Silurian Valley, Valjean Hills, and Soda Mountains. State Highway 127 generally bisects the area into east and west sections. Over 90 percent of this area is administered by the BLM. The full area is proposed for military staging, support, and limited military training activities. Construction is limited to erecting communication equipment and constructing up to six underpasses for military vehicles crossing Highway 127.

Table ES-1 summarizes the overall impacts of the Proposed Action. The former U.S. Bureau of Mines completed a mineral assessment of the Silurian Valley Withdrawal Option. The assessment identified past and present producing mines and mineral resources. Only one operating mine, which produces iron ore, is located in the Silurian Valley area. In the withdrawal process, a determination of valid existing mineral rights will be made. Acquisition of mineral rights during this process will be based on fair-market value. Acquisition costs for public and private minerals lands are based on valid existing rights, nominal prospective value, prospective value, possible developed ore reserves, and developed ore reserves. Prior to acquisition during the withdrawal process, detailed appraisals will be performed. In general, the acquisition and withdrawal of the lands from the public domain will significantly curtail most public activities within the area. The NTC has agreed to allow some existing operating mines to continue operation. Other public activities will be limited in the area, and use will be only by permission from the NTC.

Under the Proposed Action, the NTC will acquire 310,296 acres of public lands, 5,148 acres of private lands, and 15,773 acres of state lands. The public lands within this alternative will no longer be available for public use except through a defined public access policy developed by the NTC. Recreational activities, including rock hounding, camping, and off-highway vehicle (OHV) use, will be restricted within the boundaries of the Proposed Action. Both the Salt Creek and Denning Springs Areas of Critical Environmental Concern (ACEC) fall within the Proposed Action, and although they will not be impacted by military activities, access to these areas will be restricted. In addition, education and research activities will also be restricted, although the NTC will incorporate access for these activities, and for the use of Sheep Creek Springs by the Desert Studies Consortium, into the public access policy. Historic and prehistoric resources may be impacted by military activities. Five legislatively designated Wilderness Study Areas (WSAs) are located within the Proposed Action, including the Avawatz Mountains, South Avawatz Mountains, Soda Mountains, Death Valley National Park Boundary, and Kingston Range WSAs.

Implementation of the Proposed Action will result in a loss of native Mojave Desert vegetation and wildlife habitat, including habitat for a small to moderate population of the desert tortoise. Although this is a loss, the impact on the desert tortoise is much less than all other alternatives except the No Action Alternative. Furthermore, the Proposed Action was identified as the reasonable and prudent alternative by the U.S. Fish and Wildlife Service (USFWS) during prior consultation.

Implementation of the Proposed Action will result in a potential reduction of approximately 200 tons per year in dust emissions (PM-10 particulate emissions) from what is currently produced by the existing military operations at Fort Irwin. Military operations in the vicinity of Highway 127 will result in visibility impacts for motorists traveling on the highway. These impacts may occur from windblown dust as well as from the impacts of military training on the scenic quality of the lands surrounding the highway. Noise levels within the boundaries of the Proposed Action will increase due to the presence of military vehicles and aircraft, although there are very few sensitive noise receptors in areas adjacent to the boundaries. Military activities occurring in the vicinity of Utility Corridor D will have a potential to damage the utility towers and disrupt electrical service to the Los Angeles basin. Incorporation of the lands within the Proposed Action into military ownership will reduce the amount of property tax revenues received by the County of San Bernardino by approximately $17,400 per year.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
GEOLOGY Landform/ Topography	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
SOILS	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 277,244 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 226,793 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 236,175 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 190,727 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 264,776 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 170,401 acres. Potential increase in soil erosion.	Current study area activities resulting in 95 acres of new soil disturbance.
	Potential impact on 2,470 acres of dry lakebeds.	Potential impact on 2,470 acres of dry lakebeds.	Potential impact on 5,469 acres of dry lakebeds.	Potential impact on 200 acres of dry lakebeds.	Potential impact on 8,400 acres of dry lakebeds.	Potential impact on 6,800 acres of dry lakebeds.	No change in current BLM multiple-use management.
WATER RESOURCES Groundwater	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
Surface Water	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	No impacts.

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Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
BIOLOGICAL RESOURCES Plant Habitat	Potential impact on 331,217 acres of native Mojave Desert vegetation. Loss of 2,845 acres of Joshua tree woodland and 9,707 acres of desert sand fields and dunes. Potential impacts on springs.	Potential impact on 270,030 acres of native Mojave Desert vegetation. Loss of 2,700 acres of Joshua tree woodland and 6,330 acres of desert sand fields and dunes. Potential impacts on springs.	Potential impact on 259,470 acres of native Mojave Desert vegetation. Loss of 741 acres of Joshua tree woodland/Mojave woody scrub mix. Potential impacts on springs.	Potential impact on 210,800 acres of native Mojave Desert vegetation. Potential impacts on springs.	Potential impact on 284,885 acres of native Mojave Desert vegetation. Loss of Joshua tree woodland. Potential impacts on springs.	Potential impact on 185,500 acres of native Mojave Desert vegetation.	No change in current BLM multiple-use management.
Sensitive Plant Species	Potential impacts on one Federal Species of Concern (FSOC) species and several sensitive species.	Potential impacts on one FSOC and several sensitive species.	Impacts on one proposed listed endangered species, one FSOC, and one sensitive species.	Impacts on one proposed listed endangered species and one FSOC.	Impacts on one proposed listed endangered species and two FSOC.	Impacts on one proposed listed endangered species, one FSOC, and one sensitive species.	Potential impact on one proposed listed plant species and several sensitive plant species. No change in current BLM multiple-use management.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Wildlife Habitat	Loss of or disturbance to 272,780 acres of valuable wildlife habitat, including the Salt Creek riparian habitat, Sheep Creek Springs, Owl Hole Springs, and the tributaries of the Amargosa River. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Loss of or disturbance to 222,163 acres of valuable wildlife habitat, including Sheep Creek, Owl Hole Springs, and the tributaries of the Amargosa River. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Impact on 234,136 acres of valuable wildlife habitat, including Paradise Springs, Jack Springs, Jackrabbit Springs, the slopes of Alvord and Soda Mountains, and active dune systems in the vicinity of the Soda Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Impact on 190,727 acres of valuable wildlife habitat, including the slopes of Alvord and Soda Mountains and active dune systems in the vicinity of the Soda Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors.	Impact on 241,392 acres of valuable wildlife habitat in parts of the Coyote Basin eastward into low-relief lands south of the Avawatz Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Impact on 164,048 acres of valuable wildlife habitat in parts of the Goldwater Range and Coyote Basin eastward into low-relief lands east of the Avawatz Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	No change in current BLM multiple-use management.
Sensitive Wildlife Species Desert Tortoise	Substantial loss of low to moderate desert tortoise habitat within the Silurian Hills, Valjean Valley, and Soda Mountains. Impact on tortoise populations.	Substantial loss of low to moderate desert tortoise habitat within the Silurian Hills and Valjean Valley. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat within the North Alvord Slope, Southwest Coyote Basin, east of Lane Mountain, and west of Cronese Mountains. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat within Superior Valley and west of Cronese Mountains. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat. Impact on tortoise populations.	Potential impacts on desert tortoise. No change in current BLM multiple-use management.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Other Sensitive Species	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, Gila woodpecker, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, Gila woodpecker, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, burrowing owl, bats, badger, and Nelson's bighorn sheep.	No change in current BLM multiple-use management.
CULTURAL RESOURCES Prehistoric	Seventy-four known area sites; many potentially eligible for National Register of Historic Places (NRHP). Could impact NRHP sites.	Seventy-two known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred eighty known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred thirty-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred nine known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	No change in current BLM multiple-use management.
Historic	Thirty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Twenty-three known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Ninety-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Thirty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred sixty-seven known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Fifty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	No change in current BLM multiple-use management.
PALEONTOLOGICAL Paleontological Deposits	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	No change in current BLM multiple-use management.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
AIR QUALITY	Potential reduction in dust emission; less 200 tons per year PM-10 particulates. Visibility impact on Highway 127.	Potential reduction in dust emission; less 200 tons per year PM-10 particulates. Visibility impact on Highway 127.	Increase in dust emission; addition of 579 tons per year PM-10 particulates.	Increase in dust emission; addition of 263 tons per year PM-10 particulates.	Increase in dust emission; addition of 579 tons per year PM-10 particulates.	Increase in dust emission; addition of 263 tons per year PM-10 particulates.	No impacts. No change to existing emissions.
NOISE	No impacts.	No impacts.	Potential noise impact from aircraft to receptors in Harvard.	Potential noise impact from aircraft to receptors in Harvard.	Potential noise impact from aircraft to receptors in Harvard.	Potential noise impact from aircraft to receptors in Harvard.	No change in current BLM multiple-use management.
LAND USE Current Land Ownership	Acquisition of 310,296 acres public lands, 5,148 acres private lands, and 15,773 acres state lands for military use.	Acquisition of 253,300 acres public lands, 4,380 acres private lands, and 12,350 acres state lands for military use.	Acquisition of 196,914 acres public lands, 57,811 acres private lands, and 4,745 acres state lands for military use.	Acquisition of 168,700 acres public lands, 37,300 acres private lands, and 4,800 acres state lands for military use.	Acquisition of 202,254 acres public lands, 79,300 acres private lands, and 3,331 acres state lands for military use.	Acquisition of 137,600 acres public lands, 45,900 acres private lands, and 2,000 acres state lands for military use.	No change.
Existing Land Use Classifications	Military operations inconsistent with existing BLM multiple-use areas and Salt Creek Hills and Denning Springs ACECs, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas and crucifixion thorn assemblage unusual plant assemblage (UPA), resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas and crucifixion thorn assemblage UPA, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in an impact.	No change in current BLM multiple-use management.

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SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Grazing and Western Mojave Land Tenure Adjustment Program	Impact from loss of 29,200 grazing acres.	Impact from loss of 490 grazing acres.	Impact from loss of 97,746 grazing acres and reduction of 50,560 acres of private land in the Western Mojave Land Tenure area.	Impact from loss of 69,586 grazing acres and reduction of 35,840 acres of private land in the Western Mojave Land Tenure area.	Impact from loss of 118,106 grazing acres and reduction of 151,680 acres of private land in the Western Mojave Land Tenure area.	Impact from loss of 41,606 grazing acres and reduction of 51,840 acres of private land in the Western Mojave Land Tenure area.	No change in current BLM multiple-use management.
RECREATION							
Land Sailing	Impact from loss of opportunity to use Silurian Dry Lake.	Impact from loss of opportunity to use Silurian Dry Lake.	No impacts.	No impacts.	Impact from loss of opportunity to use Superior Dry Lake 1.	No impacts.	No change in current BLM multiple-use management.
Rock Hounding	Impact from loss of opportunity to use Avawatz Mountains.	Impact from loss of opportunity to use Avawatz Mountains.	Impact from loss of opportunity to use, South Avawatz Mountains, Alvord Mountain, and Spanish Canyon.	Impact from loss of opportunity to use Alvord Mountain and Spanish Canyon.	Impact from loss of opportunity to use Lane Mountain, Alvord Mountain, and Spanish Canyon.	Impact from loss of opportunity to use Alvord Mountain and Spanish Canyon.	No change in current BLM multiple-use management.
Sightseeing and Camping	Impact from loss of opportunity to use 310,296 acres of public lands.	Impact from loss of opportunity to use 253,300 acres of public lands.	Impact from loss of opportunity to use 196,914 acres of public lands, including Spanish Canyon and Paradise Springs camp areas.	Impact from loss of opportunity to use 168,700 acres of public lands, including Spanish Canyon camp area.	Impact from loss of opportunity to use 202,254 acres of public lands, including Spanish Canyon and Paradise Springs camp areas.	Impact from loss of opportunity to use 137,600 acres of public lands, including Paradise Springs camp areas.	No change in current BLM multiple-use management.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Off-Highway Vehicle (OHV) Use	Impact from restricted use of 35 miles of maintenance road and several trails.	Impact from restricted use of 5.5 miles of maintenance road and several trails.	Impact from restricted use of 136 miles of trail, including 35.5 miles of maintenance road.	Impact from restricted use of 136 miles of trail, including 35.5 miles of maintenance road.	Impact from restricted use of Superior Valley area and 100 miles of trail.	Impact from restricted use of 100 miles of trail.	No change in current BLM multiple-use management.
Horseback Riding	No impacts.	No impacts.	Impact from losing use of a portion of Superior Valley.	No impacts.	Impact from losing use of northern end of Mud Hills, Lane Mountain, Spanish Canyon, and Paradise Valley.	No impacts.	No impacts.
Hunting and Shooting	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
MINING Impacts from potential jobs lost	Potential impacts from loss of jobs. Small production level - 682 jobs to large production level - 3,247 jobs.	Potential impacts from loss of jobs. Small production level - 682 jobs to large production level - 3,247 jobs.	Potential impacts from loss of jobs. Small production level - 796 jobs to large production level - 3,625 jobs.	Potential impacts from loss of jobs. Small production level - 796 jobs to large production level - 3,625 jobs.	Potential impacts from loss of jobs. Small production level - 796 jobs to large production level - 3,625 jobs.	Potential impacts from loss of jobs. Small production level - 682 jobs to large production level - 3,247 jobs.	No change from current conditions.
Impacts from potential taxes lost	Potential impacts from lost taxes. Small production level - $836,000 to large production level - $10,343,000.	Potential impacts from lost taxes. Small production level - $836,000 to large production level - $10,343,000.	Potential impacts from lost taxes. Small production level - $909,000 to large production level - $10,679,000.	Potential impacts from lost taxes. Small production level - $909,000 to large production level - $10,679,000.	Potential impacts from lost taxes. Small production level - $909,000 to large production level - $10,679,000.	Potential impacts from lost taxes. Small production level - $836,000 to large production level - $10,343,000.	No change from current conditions.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Impacts from cost of mine purchase per year	Potential impacts from loss of mine purchase per year. Small production level - $10,561,000 to large production level - $95,960,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,561,000 to large production level - $95,960,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,977,000 to large production level - $97,667,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,977,000 to large production level - $97,667,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,977,000 to large production level - $97,667,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,561,000 to large production level - $95,960,000.	No change from current conditions.
UTILITY CORRIDORS	Potential impact on 70 square miles of utility corridor.	Potential impact on 12 square miles of utility corridor.	Potential impact on 113 square miles of utility corridor.	Potential impact on 79 square miles of utility corridor.	Potential impact on 42 square miles of utility corridor.	Potential impact on 30 square miles of utility corridor.	No change from current conditions.
TRANSPORTATION	Potential impacts on I-15 and Highway 127 due to dust generation. Restricted access to Silver Lake Road, Saratoga Springs Road, and Old Railroad Road.	Potential impact on Highway 127 due to dust generation. Restricted access to Silver Lake Road, Saratoga Springs Road, and Old Railroad Road.	Restricted access to Alvord Mountain and Coyote Lake Roads. Impact on I-15 due to dust generation.	Restricted access to Alvord Mountain and Coyote Lake Roads. Impact on I-15 due to dust generation.	Restricted access to Copper City Mine Road and Superior Lake. Restricted access to Alvord Mountain and Coyote Lake Roads.	Restricted access to Alvord Mountain and Coyote Lake Roads.	No impacts.
SOCIOECONOMICS	Loss of $17,400 from county property tax revenues.	Loss of $14,800 from county property tax revenues.	Loss of $214,200 from county property tax revenues.	Loss of $143,900 from county property tax revenues.	Loss of $286,800 from county property tax revenues.	Loss of $173,900 from county property tax revenues.	No impacts.
EDUCATION AND RESEARCH	Impacts from restricted use of research areas - Sheep Creek Springs, Silurian Hills Geologic Study Area, areas of Soda Mountains and West Cronese Basin.	Impacts from restricted use of access to research areas - Sheep Creek Springs, areas of Soda Mountains and West Cronese Basin.	Impacts from restricted use of access to research areas - Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, and Calico Mountains.	Impacts from restricted use of access to research areas - Soda Mountains, Alvord Mountain, Spanish Canyon, and West Cronese Basin.	Impacts from restricted use of access to research areas - Alvord Mountain, Spanish Canyon, Calico Mountains, and Mud Hills.	Impacts from restricted use of access to research areas - Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, and Calico Mountains.	No impacts.

Table ES-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
WILDERNESS CHARACTERISTICS Potential impact on loss of wilderness values in WSAs	Impacts on Avawatz Mountains, South Avawatz Mountains, Kingston Range, and Soda Mountains WSAs.	Impacts on Avawatz Mountains, South Avawatz Mountains, and Kingston Range WSAs.	Impacts on South Avawatz Mountains, Soda Mountains, and Avawatz Mountains WSAs.	Impacts on South Avawatz Mountains, Soda Mountains, and Avawatz Mountains WSAs.	Impacts on South Avawatz Mountains and Avawatz Mountains WSAs.	Impacts on South Avawatz Mountains and Avawatz Mountains WSAs.	No impacts.
AIRSPACE	Army will replace three USAF contact points. No impacts are expected.	Army will replace three USAF contact points. No impacts are expected.	Army will replace three USAF contact points. Impacts from restricted use of USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain following route, and Ventura holding point.	Army will replace three USAF contact points. No impacts are expected.	Army will replace two USAF contact points. Impacts from restricted use on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain following route, and Ventura holding point.	Army will replace two USAF contact points. Impacts from curtailed use on USAF's Cords Road Area, Black Mountain Supersonic Corridor, and Black Mountain following route.	No impacts.
AESTHETIC RESOURCES	Impact on views along Highway 127.	Impact on views along Highway 127.	Impact on views along I-15.	Impact on views along I-15.	Impact if actions involve Lane Mountain.	No impacts expected.	No impacts.
SOLID WASTE AND HAZARDOUS SUBSTANCES	No impacts expected.	No impacts expected.	No impacts expected.	No impacts expected.	No impacts expected.	No impacts expected.	No impacts.

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SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
HUMAN AND HEALTH SAFETY	Impacts from potential safety hazards associated with military operations in 70 square miles of utility corridors and in proximity to Highway 127.	Impacts from potential safety hazards associated with military operations in 12 square miles of utility corridors and in proximity to Highway 127.	Impacts from potential safety hazards associated with military operations in 113 square miles of utility corridors.	Impacts from potential safety hazards associated with military operations in 79 square miles of utility corridors.	Impacts from potential safety hazards associated with military operations in 42 square miles of utility corridors.	Impacts from potential safety hazards associated with military operations in 30 square miles of utility corridors.	No impacts.

ES.2.2 Modified Avawatz-Silurian Alternative

The Modified Avawatz-Silurian Alternative is similar to the Proposed Action in that it primarily lies east and north of Fort Irwin. The major differences between the two are that the boundary of the Modified Avawatz-Silurian Alternative lies approximately ½ mile north of Utility Corridor D, whereas the Proposed Action includes approximately 70 miles of this utility corridor, and the Silurian Hills mineralized area and Salt Creek ACEC have been excluded. The Modified Avawatz-Silurian Alternative encompasses approximately 270,030 acres, of which approximately 226,793 acres are considered net maneuverable. Most of the lands within this alternative are administered by the BLM.

Under the Modified Avawatz-Silurian Alternative, the NTC will acquire 253,300 acres of public lands, 4,380 acres of private lands, and 12,350 acres of state lands. The public lands within this alternative will no longer be available for public use except through a defined public access policy developed by the NTC. Recreational activities, including rock hounding, camping, and OHV use, will be restricted within the boundaries of this alternative. The Denning Springs ACEC falls within the Modified Avawatz-Silurian Alternative, and although it will not be impacted by military activities, access to this area will be restricted. In addition, education and research activities will also be restricted, although the NTC will incorporate access for these activities and for the use of Sheep Creek Springs by the Desert Studies Consortium into the public access policy. Historic and prehistoric resources may be impacted by military activities. Four legislatively designated WSAs are located within this alternative, including the Avawatz Mountains, South Avawatz Mountains, Death Valley National Park Boundary, and Kingston Range WSAs.

The potential loss of native Mojave Desert vegetation (270,030 acres) and wildlife habitat is expected to be similar to the Proposed Action, although the magnitude of the potential impacts is less. This alternative will also impact the same desert tortoise populations as mentioned under the Proposed Action.

Impacts associated with this alternative are similar to the Proposed Action with the exception of impacts on utilities and potential impacts mining and the Salt Creek Hills ACEC. Because Utility Corridor D lies south of the boundary of this alternative, military vehicles will not be maneuvering within or adjacent to the corridor. Military vehicles will use a transportation corridor to cross Utility Corridor D. The transportation corridor will provide the necessary ingress and egress into the acquisition area and will cross Utility Corridor D at only two points.

Other impacts resulting from the Modified Avawatz-Silurian Alternative are expected to be similar to those described for the Proposed Action. Like the Proposed Action, implementation of the Modified Avawatz-Silurian Alternative will also result in a beneficial reduction of approximately 200 tons per year in dust emissions (PM-10 particulate emissions) from what is currently produced by the existing military operations at Fort Irwin. This alternative will have similar impacts on Highway 127, relating to visual impairment, as discussed for the Proposed Action. Noise level increases are also expected to be the same as the Proposed Action. Military activities occurring in the vicinity of Utility Corridor D will have less potential to damage the utility towers and disrupt electrical service to the Los Angeles basin than the Proposed Action. Incorporation of the lands within the Modified Avawatz-Silurian Alternative into military ownership will reduce the amount of property tax revenues received by the County of San Bernardino by approximately $14,800 per year.

ES.2.3 Modified Coyote Basin Alternative

The Modified Coyote Basin Alternative would entail the acquisition of approximately 259,470 acres, of which 236,175 acres are considered net maneuverable. Most of the area is administered by the BLM, but this alternative also contains a substantial amount of privately owned land.

Under the Modified Coyote Basin Alternative, the NTC will acquire 196,914 acres of public lands, 57,811 acres of private lands, and 4,745 acres of state lands. The public lands within this alternative will no longer be available for public use except through a defined public access policy developed by the NTC. Recreational activities, including rock hounding, camping, and OHV use, will be restricted within the boundaries of this alternative. This includes access restrictions at Spanish Canyon and Paradise Springs, two areas that receive a substantial number of visitors each year. In addition, education and research activities will also be restricted, although the NTC will incorporate access for these activities into the public access policy. Historic and prehistoric resources may be impacted by military activities. Three legislatively designated WSAs are located within the Modified

Coyote Basin Alternative, including the Avawatz Mountains, South Avawatz Mountains, and Soda Mountains WSAs.

The potential loss of native Mojave Desert vegetation (259,470 acres) and wildlife habitat is expected to be similar to the Proposed Action, although the magnitude of the potential impacts is less. Implementation of the Modified Coyote Basin Alternative will result in impacts on the crucifixion thorn unusual plant assemblage (UPA) located in the southeastern portion of the alternative. This alternative will have a greater impact on the desert tortoise than the Proposed Action or the Modified Avawatz-Silurian Alternative. The USFWS issued a Jeopardy Opinion on this acquisition alternative due to impacts on the desert tortoise.

Implementation of the Modified Coyote Basin Alternative will result in an increase in dust emissions by approximately 579 tons per year (PM-10 particulate emissions) from what is currently produced by the existing military operations at Fort Irwin. Noise levels within the boundaries of the Modified Coyote Basin Alternative will increase due to the presence of military vehicles and aircraft. Sensitive noise receptors do occur in areas adjacent to the boundaries of this alternative. Military activities occurring in the vicinity of Utility Corridors D and Q will have a greater potential to damage the utility towers than the Proposed Action or the Modified Avawatz-Silurian alternative, and may also disrupt electrical service to the Los Angeles basin. Incorporation of the lands within the Modified Coyote Basin Alternative into military ownership will reduce the amount of property tax revenues received by the County of San Bernardino by approximately $214,200 per year.

ES.2.4 Alvord Alternative

The Alvord Alternative encompasses approximately 210,800 acres, yielding approximately 190,727 acres of net maneuverable land. Impacts will be similar to the Modified Coyote Basin Alternative.

Under the Alvord Alternative, the NTC will acquire 168,700 acres of public lands, 37,300 acres of private lands, and 4,800 acres of state lands. The public lands within this alternative will no longer be available for public use except through a defined public access policy developed by the NTC. Recreational activities, including rock hounding, camping, and OHV use, will be restricted within the boundaries of this alternative. This includes access restrictions at Spanish Canyon, an area that receives a substantial number of visitors each year. In addition, education and research activities will also be restricted, although the NTC will incorporate access for these activities into the public access policy. Historic and prehistoric resources may be impacted by military activities. Three legislatively designated WSAs are located within the Alvord Alternative, including the Avawatz Mountains, South Avawatz Mountains, and Soda Mountains WSAs.

The potential loss of native Mojave Desert vegetation (210,800 acres) and wildlife habitat is expected to be similar to the Modified Coyote Basin Alternative. The most serious impacts will be from the large-scale loss of Mojave creosote scrub or Mojave creosote scrub/Joshua tree woodland mix. Implementation of the Alvord Alternative will result in impacts on the crucifixion thorn UPA located in the southeastern portion of the alternative. The impacts on the desert tortoise for this alternative are significant and similar to the Modified Coyote Basin Alternative; however, the impacts will be less because the Alvord Alternative is smaller. This alternative will have a greater impact on the desert tortoise than the Proposed Action or the Modified Avawatz-Silurian Alternative.

Implementation of the Alvord Alternative will result in an increase of approximately 263 tons per year in dust emissions (PM-10 particulate emissions) from what is currently produced by the existing military operations at Fort Irwin. Military operations in the vicinity of I-15 will result in visibility impacts for motorists traveling on the interstate. Noise levels within the boundaries of the Alvord Alternative will increase due to the presence of military vehicles and aircraft. Sensitive noise receptors do occur in areas adjacent to the boundaries of this alternative. Military activities occurring in the vicinity of Utility Corridor D will have the same potential to damage the utility towers as the Modified Coyote Basin Alternative but less potential than the Modified Coyote Basin Alternative to damage Utility Corridor Q, and may also disrupt electrical service to the Los Angeles basin. Incorporation of the lands within the Alvord Alternative into military ownership will reduce the amount of property tax revenues received by the County of San Bernardino by approximately $143,900 per year.

ES.2.5 Superior Valley Alternative

The Superior Valley Alternative would encompass approximately 284,885 acres, yielding approximately 264,776 net maneuverable acres. Impacts of this alternative would be similar to the Modified Coyote

Basin Alternative, except that there would be increased impacts on land sailing because prime land sailing areas would be reduced.

Under the Superior Valley Alternative, the NTC will acquire 202,254 acres of public lands, 79,300 acres of private lands, and 3,331 acres of state lands. The public lands within this alternative will no longer be available for public use except through a defined public access policy developed by the NTC. Recreational activities, including rock hounding, camping, and OHV use, will be restricted within the boundaries of this alternative. This includes access restrictions at Spanish Canyon and Paradise Springs, two areas that receive a substantial number of visitors each year. In addition, education and research activities will also be restricted, although the NTC will incorporate access for these activities into the public access policy. Historic and prehistoric resources may be impacted by military activities. Three legislatively designated WSAs are located within the Superior Valley Alternative, including the Avawatz Mountains and South Avawatz Mountains WSAs.

The potential loss of native Mojave Desert vegetation (284,885 acres) and wildlife habitat is expected to be similar to the Modified Coyote Basin Alternative, although the magnitude of the potential impacts is greater. However, there will be no impact on the crucifixion thorn UPA. This alternative could lead to the elimination of more than twice the amount of Joshua tree woodland than any other alternative. This alternative has a greater impact on desert tortoise than the Modified Coyote Basin Alternative.

Implementation of the Superior Valley Alternative will result in an increase of approximately 579 tons per year in dust emissions (PM-10 particulate emissions) from what is currently produced by the existing military operations at Fort Irwin. This alternative will restrict the use of Copper City Mine Road and Superior Lake. Noise levels within the boundaries of the Superior Valley Alternative will increase due to the presence of military vehicles and aircraft. Sensitive noise receptors do occur in areas adjacent to the boundaries of this alternative. Military activities occurring in the vicinity of Utility Corridor Q will have the same potential to damage the utility towers as the Modified Coyote Basin Alternative, and may also disrupt electrical service to the Los Angeles basin. Incorporation of the lands within the Superior Valley Alternative into military ownership will reduce the amount of property tax revenues received by the County of San Bernardino by approximately $286,800 per year.

ES.2.6 Avawatz Alternative

The Avawatz Alternative involves approximately 185,500 acres yielding approximately 170,401 net maneuverable acres. The impacts of this alternative are similar to the Modified Coyote Alternative.

Under the Avawatz Alternative, the NTC will acquire 137,600 acres of public lands, 45,900 acres of private lands, and 2,000 acres of state lands. The public lands within this alternative will no longer be available for public use except through a defined public access policy developed by the NTC. Recreational activities, including rock hounding, camping, and OHV use, will be restricted within the boundaries of this alternative. This includes access restrictions at Paradise Springs, an area that receives a substantial number of visitors each year. In addition, education and research activities will also be restricted, although the NTC will incorporate access for these activities into the public access policy. Historic and prehistoric resources may be impacted by military activities. Two legislatively designated WSAs are located within the Avawatz Alternative, including the Avawatz Mountains and South Avawatz Mountains WSAs.

The potential loss of native Mojave Desert vegetation (185,500 acres) and wildlife habitat is expected to be similar to the Modified Coyote Basin Alternative, although the magnitude of the potential impacts is less. This alternative will have a greater impact on the desert tortoise than the Proposed Action or the Modified Avawatz-Silurian Alternative.

Implementation of the Avawatz Alternative will result in an increase of approximately 263 tons per year in dust emissions (PM-10 particulate emissions) from what is currently produced by the existing military operations at Fort Irwin. Noise levels within the boundaries of the Avawatz Alternative will increase due to the presence of military vehicles and aircraft. Sensitive noise receptors do occur in areas adjacent to the boundaries of this alternative. Military activities occurring in the vicinity of Utility Corridor Q will have a greater potential to damage the utility towers than the Alvord Alternative and may also disrupt electrical service to the Los Angeles basin. Incorporation of the lands within the Avawatz Alternative into military ownership will reduce the amount of property tax revenues received by the County of San Bernardino by approximately $173,900 per year.

ES.2.7 No Action Alternative

The No Action Alternative involves no acquisition of lands to provide additional training at the NTC. Current operations within the existing boundaries of the NTC would continue. No impacts associated with military training would occur on any of the lands within the study area. Activities permitted on public and private lands within the area would continue under the California Desert Conservation Area Plan.

However, if no additional training lands were acquired, there would be substantial impacts on the training mission at the NTC. Soldiers would not be trained under realistic battle conditions because the time and distance factors associated with an actual battle could not be accurately portrayed. The lack of training using realistic time and distance factors was identified in Desert Storm where incidents occurred in which commanders did not allow adequate time for resupply of combat units. The mission of National Guard and Reserve units would also be impacted because it will be difficult to train these units while meeting the training requirements for regular Army units.

ES.3 ANALYSIS OF ALTERNATIVES NOT ANALYZED IN DETAIL

Table ES-2 provides a summary of those alternatives initially considered but eliminated from detailed analysis because they were not considered feasible.

ES.4 PRELIMINARY SCOPING PROCESS AND ISSUES

The initial scoping period consisted of a series of six public scoping meetings held in five cities during September 1988. Further scoping opportunities were provided in August 1990 to update the original study area, in February 1992 for the Silurian Valley Alternative (Proposed Action), and February 1993 for consideration of Navy lands. A number of issues have been identified and considered for investigation in this DEIS as a result of both initial resource studies and public participation through the public scoping periods. These issues reflect current public, BLM, and Army management concerns. The following issues are addressed in this DEIS:

- wildlife resources;
- mining on public and private lands;
- utility corridors;
- wilderness characteristics;
- soils;
- vegetation;
- air quality/dust generation;
- airspace;
- cultural, historic, and paleontological resources;
- livestock grazing;
- visual resources;
- water resources;
- land ownership;
- recreation (rock hounding, land sailing, OHV use, camping and sightseeing, hunting and shooting, and horseback riding);
- use and occupancy of private lands (residency, agriculture, religious, and organizational uses; and development of private lands);
- local communications utility facilities;
- transportation and access;
- education and research;
- solid waste and hazardous substances;
- social and economic considerations of changes in employment at NTC; and
- health and safety.

A list of other public scoping concerns is provided in Section 7. A complete scoping meeting report dated November 1988 prepared by Sharon Clark Associates is on file at BLM's Barstow Resource Area office.

Table ES-2

SUMMARY OF ALTERNATIVES NOT CONSIDERED IN DETAIL

Alternative	Description	Reason for Elimination from Detailed Analysis
Coyote Basin	Similar to Modified Coyote Basin Alternative but encompasses additional area.	More impact on desert tortoise populations than Modified Coyote Basin Alternative and little gain in functional training areas.
WSA Exclusion	Similar to Coyote Basin Alternative but excludes potential wilderness areas.	Due to changes in Desert Plan legislation, this alternative was no longer considered.
Silurian/Mojave B Range	This alternative included the Proposed Action plus a portion of the Mojave B Ranges administered by the U.S. Navy west of the NTC.	The U.S. Navy determined that joint use of this area would conflict with its present mission.
Mojave B Range Only	This alternative would use only a portion of the Mojave B Range west of NTC.	This area is too small to fully meet NTC needs, plus the Navy has determined that joint use would conflict with its mission.
Use of Areas North of NTC	This alternative would use areas north of the NTC.	The alternative would significantly impact the Death Valley National Park.
Leach Lake Gunnery Range	This alternative would involve the use of the bombing and gunnery range at Leach Lake.	Implementation of this alterative would significantly impact USAF training missions. Additionally, high levels of contamination over the majority of the site with unexploded ordnance would render the area unsuitable for training.
Marine Corps Air/Ground Combat Center at Twentynine Palms	Use of this Marine Corps training area for NTC uses.	The use of this area for NTC uses would impact the ongoing mission at Twentynine Palms; furthermore, the range is not instrumented to meet NTC purposes.

Table ES-2

SUMMARY OF ALTERNATIVES NOT CONSIDERED IN DETAIL

Alternative	Description	Reason for Elimination from Detailed Analysis
Use of Other Nonadjacent or Out-of-State Military Lands	The alternative to use other military lands was explored, including Fort Bliss, Texas; Dugway Proving Ground, Utah; Pueblo Army Depot, Colorado; Yuma Proving Ground, Arizona; Fort Hood, Texas; Fort Drum, New York; British Army Training Unit, Suffield, Alberta Canada; Canadian Forces Base, Shilo Whonteil, Manitoba Canada.	Each alternative was considered infeasible due to impacts with other missions, noninstrumentation of ranges, lack of required terrain diversity, and inability to coordinate with air force units.
Closure of NTC	This alternative would involve closure of the entire NTC.	The training of Army units under large-scale realistic combat conditions would not continue, resulting in a major gap in training of combat units. If another NTC were established, there would be major costs involved in instrumentation and other facilities.
Increased Use of Simulation	This alternative would use increased computer simulation rather than acquisition of additional lands.	The increased use of simulation will not provide realistic combat training situations.

ES.5 SUMMARY OF ENVIRONMENTAL COMMITMENTS

Table ES-3 provides a summary of environmental commitments (subject to availability of NTC funding).

ES.6 SUMMARY OF PROBABLE RESIDUAL IMPACTS

A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table ES-4.

ES.7 BLM PREFERRED ALTERNATIVE

The Council on Environmental Quality (CEQ) regulations, and the Department of the Interior Manual 516, implementing NEPA require identification of the lead Federal agency's preferred alternative in Draft and Final Environmental Impact Statements (EIS). On November 26, 1996, the Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance (OEPC) granted BLM permission to delay identification of a BLM preferred alternative until the Final EIS. The BLM followed the required procedures outlined in the CEQ regulations and DM 516 in the request, review and OEPC approval. The BLM, as Lead Agency, has not selected an agency preferred alternative in this DEIS. The BLM will select an agency preferred alternative for the Final EIS after taking into consideration comments of the public, agencies, organizations, and the needs of the proponent.

Table ES-3

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Geology	No significant impacts are expected. No mitigation is required.
Soils	Lakebeds in the acquisition area shall be marked off limits on training maps. The lakebed areas shall be marked as hazards during exercises.
Water Resources	Direct access to springs identified for this alternative shall be restricted by posting signs and installing fencing and/or metal crossbars to prohibit encroachment. Field personnel shall avoid springs and riparian areas. Staff shall be briefed prior to exercises, and appropriate signage and fencing shall be used. Once installed, post instrumentation and communication systems shall be used during military exercises to track and direct vehicles away from spring areas.
Biological Resources	Foot traffic in areas with a slope of more than 20 percent shall avoid repeated disturbance to the same area whenever possible. Dunes in the northeast portion of the alternative shall be placed off limits to military maneuvers. Construction of new roads shall avoid sensitive vegetation communities wherever possible. A buffer zone, at a width to be established in consultation with the appropriate resource agency, shall be established between sensitive communities and roads. The 10 springs in the Avawatz region in the Silurian Valley shall be off limits. Access to the Salt Creek riparian habitat, Sheep Creek, Owl Hole Spring, and the tributaries of the Amargosa River shall be restricted. Per the Biological Opinion, tortoise-proof fencing shall be placed along the boundary of the training area, as shown on Figure 4.5-1, southeast of the geological feature known as "the whale." Identified tortoise populations of greater than 20 tortoises/square mile shall be protected with a 1-kilometer buffer zone. This buffer zone shall be enforced using signage and available technology used by the Army. The NTC shall initiate efforts to take an active role in the recovery of the desert tortoise. Participation in planning efforts for the West Mojave Coordinated Management Plan could constitute a means of undertaking such recovery efforts. Hunting and fishing shall not be allowed within any acquisition areas. The NTC shall continue to support the ongoing Juvenile Tortoise Research Project (JTREP) on the installation subject to availability of funding and in consultation with USFWS. The NTC shall monitor all fencing and off-limits areas. The existing NTC desert ecology/desert tortoise education program shall be expanded to increase awareness of desert ecology and the importance of eliminating adverse yimpacts on tortoises and other sensitive species found on the base and within the expansion area. This program shall continue to be provided to soldiers, family members, and rotational units, and shall be expanded to include the NTC contract and government workforce, especially those who work on the ranges. Soldiers permanently stationed at the NTC shall attend a formal briefing on tortoises, other sensitive species, and locations of protected areas. Rotational units shall continue to be informed on desert ecology and sensitive species upon arrival at NTC and prior to their field exercises.

Table ES-3

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Biological Resources (Continued)	An educational video shall be prepared to be shown at appropriate briefings and made available to other groups on Fort Irwin (i.e., Boy/Girl Scouts, Officer and Civilian Wives Club, and unit spouse groups). A presentation for school children shall occur at on-base schools each school year. Additional forms of educational distribution shall include informational bulletins and signs, educational notices in the post newspaper, and broadcasting on the post information channel. Caves and mineshafts shall be placed off limits. Nelson's bighorn sheep habitat shall be conserved, and any human-induced barriers to bighorn sheep movement shall be minimized. All potential water sources for this species shall be preserved.
Cultural	Section 106 consultation shall be required for formal determination of NRHP eligibility for all sites in this alternative. Formal eligibility can only be determined in consultation with the State Historic Reservation Officer (SHPO). Additional mitigation measures for potential adverse effects on cultural resources shall be formulated after eligibility determinations are concluded. A Programmatic Agreement (PA) between the Army, the California SHPO, and the Advisory Council on Historic Preservation shall be instituted to determine the program for treatment of cultural resources.
Paleontology	The NTC shall implement a continuing program of resource identification. If fossil deposits are located, they shall be evaluated to determine the effect of training activities and the feasibility of avoidance. If avoidance is not possible, the sites shall be mapped, and data shall be recovered and then curated at an appropriate institution. A standard paleontologic resource impact mitigation program must be developed in accordance with the (California Environmental Quality Act (CEQA) guidelines and the Society of Vertebrate Paleontology.
Air Quality	The NTC shall implement dust control measures, including the use of snow fencing, vegetation, and safety hazard signs. Dust control measures such as regular watering, chemical treatment, and an asphalt chip sealer shall be used in primary dust generation areas.
Noise	No significant impacts have been identified, and no mitigation is necessary. However, should any existing residents located in proximity to the boundary of the acquisition area experience excessive noise levels, the Army is committed to, on a case-by-case basis, respond to any complaints of noise by monitoring noise levels and taking appropriate remedial action in accordance with Army Regulation (AR) 200-1.
Land Use	A public access policy shall be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area as is presently done on the existing NTC. Access shall also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, OHVs, etc.
Recreation	A public access policy shall be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area as is presently done on the existing NTC. Access shall also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, OHVs, etc.

Table ES-3

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Mining	Valid mineral interests within the proposed withdrawal shall be considered for acquisition except those mining and exploratory operations ongoing at the time of the withdrawal that the Army has determined shall not interfere with the NTC mission. Mineral resource development and mineral surface activity within the withdrawal on mining claims with valid existing rights, leases, contracts, or permits on federal land shall be managed under the authority of the Secretary of the Interior by the BLM (43 U.S.C. 158). Regulations in Title 43 CFR 3809 shall be used to implement the BLM's surface management and reclamation oversight responsibilities on unpatented mining claims. Authority also exists for BLM management of leasable and salable mineral resources under the same title. Private mineral interests within the preferred alternative shall be purchased by the Army under appropriate acquisition authority. Mineral lands acquired by the Army shall not be considered public lands included in the proposed withdrawal but could be made available for mineral leasing under enabling legislation sought by BLM and the NTC. The threshold for determining whether mineral activity shall be allowed shall be based on an evaluation of mission and environmental compatibility in accordance with specific legislation authorizing the withdrawal. If in the future the U.S. Army determines that withdrawn lands are no longer needed and/or that mineral development shall not affect the mission of the NTC, development of hardrock mineral interests [minerals subject to location or sale as defined in the regulations at 43 CFR 3500.05 (n)] acquired by the Army shall be available under appropriate mineral law administered by the BLM after such lands either reverted back to the public domain or determined to be available for exploration or development under the pilot leasing program sought by the BLM and the NTC. Mineral development proposals on unpatented mining claims that have not exhibited ongoing mineral development activity as of the date of the withdrawal shall be examined to determine if they have valid existing rights (VERs). Those that do not shall be contested; those unpatented claims that do have VERs shall be acquired by the Army. The NTC may consent to the development of a VER on a case-by-case basis, having first determined that such development shall not interfere with the NTC mission. Any permitted development shall be in accordance with appropriate BLM regulations and under restrictions protecting the NTC mission. Just compensation for any decrease in the value of VERs shall be paid by the Army. Private mineral interests acquired by the Army may be available for permit, lease, and development of coal, phosphate, oil, oil shale, gilsonite (including vein-type solid hydrocarbons), gas, sodium, potassium, and sulfur under the authority of the Acquired Lands Leasing Act of August 7, 1947 (30 U.S.C. 351,352). Applications for the above minerals shall be reviewed by the Army to assure that such lease shall be consistent with the purpose and intent of the NTC. Permits and leases shall be administered by the BLM and subject to such stipulations ensuring that the mission of the NTC shall not be affected. Development of hardrock mineral interests (minerals subject to location or sale as defined in the regulations at 43 CFR 3500.05[n]) acquired by the Army shall be authorized under appropriate mineral law administered by the BLM after such lands revert to the public domain pursuant to a determination by the U.S. Army that the withdrawn lands are no longer needed and that mineral development shall not affect the mission of the NTC, or under a pilot leasing program pursuant to special legislation sought by the BLM and the NTC.

Table ES-3

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Mining (Continued)	The area proposed for withdrawal shall be reviewed for the appropriateness of segregation from entry under the mining laws every 5 years following the effective date of the withdrawal. Such review shall be in accordance with the procedures and requirements of Section 204 of the Federal Land Policy and Management Act (FLPMA). Post-withdrawal mineral authorizations, leases, permits, contracts, or locations could be allowed. Any authorization shall require specific legislation allowing for such use and shall be limited to the provisions of existing statutes (43 U.S.C. 158). All use approvals shall be managed by the BLM in accordance with existing laws and regulations. Any use authorizations shall be subject to the concurrence of the NTC, and post-authorization exploration or mining plans of operation shall have to be conducted in such a manner as not to adversely affect the purpose of the NTC expansion and mission of the NTC.
Utility Corridors	The NTC shall establish a 24-hour staff to coordinate utility company access for maintenance, inspection, and repair. The NTC shall restrict use of existing service roads to utility company maintenance personnel only. Crossing areas shall be established that adhere to the following criteria: (1) the crossing area shall, when possible, be at a midway point between the towers, (2) protective barriers shall be erected or permanently installed in areas where bottlenecking of vehicles occurs prior to or after crossing to prevent tracked vehicles from colliding with adjacent transmission towers, (3) engagements with the opposing force regiment (OPFOR) shall be restricted from occurring within 3 miles from the transmission lines, and (4) the crossing area shall be excavated below grade to assure the necessary clearance between the booms of the tracked towing vehicles and the conductor lines. Flight markers shall be installed on the outside conductor lines. Rotary-winged aircraft shall be restricted to designated air sectors away from transmission lines. To mitigate conflicts between utility company and military rotary-winged aircraft, the utility company shall schedule its maintenance flyovers with the point of contact (POC) at the NTC. WILLTEL fiber-optic cable shall be protected by either an underground encasement for fiber-optic cable to pass through and/or deeper burial depth at the designated crossing points. The natural gas pipeline shall be marked sufficiently along its route and especially in the crossing areas to indicate its location and provide a warning not to dig in the vicinity. The two block-valve locations for the pipeline shall be protected by installing concrete bollards or steel pipes with suitable footings around the existing chainlink perimeter fence. Reflectors shall be installed on each fence.
Transportation and Access	No significant impacts are expected.
Socioeconomics	No significant impacts are expected.

Table ES-3

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Education and Research	A public access policy shall be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area, as is presently done on the existing NTC. Access shall also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, OHV, etc. The Army shall develop a cooperative agreement with the California State University System/Desert Studies Consortium to arrange access to and use of the existing research facility at Sheep Creek Springs.
Wilderness Characteristics	Access routes into wilderness areas from the NTC shall be gated and posted with signs stating "You are entering a wilderness area. No motorized vehicles allowed."
Airspace	No significant impacts are expected.
Aesthetics	To the extent possible, new roadways and undercrossings shall be designed to blend into the surrounding landscape.
Solid Waste and Hazardous Substances	No significant impacts are expected.
Health and Safety	The initial briefing for soldiers who travel to Fort Irwin shall include detailed information on both the hazards of performing desert maneuvers and the principles of desert survival. This briefing shall cover geological, hydrological, biological, and climatic hazards, as well as hazards from wildfires. They shall be briefed on earthquake safety prior to dispersing into the field for training maneuvers. A contingency plan shall be developed to provide soldiers with guidelines on what to do following a major seismic event. Soldiers shall be briefed on the dangers of flash floods and erosion hazards during and after heavy rainstorms. To minimize the health risks of desert maneuvers, soldiers shall be briefed on desert survival and the signs of heat stroke and heat exhaustion. Every soldier shall be provided with adequate water during maneuvers and shall be properly trained in first aid for heat exhaustion and heat stroke. In addition, adequate communications and rescue shall be available for evacuating injured soldiers or those in distress from the extreme conditions of the desert. Soldiers shall be provided with adequate water and shade-producing devices in the event that they become separated from their unit or stranded in the desert. Roll call shall be taken at the end of every day to ensure that no soldiers are missing from their training units. Soldiers shall also be provided with flares or some other device that can be used to indicate where they are if they become stranded. Adequate communication devices shall be available in the event that soldiers are discovered missing and to facilitate a rescue if necessary. An earthquake contingency plan shall be developed and implemented by the NTC that alerts soldiers to the risks associated with activities near utility corridors. In the event of an earthquake, all troops shall take action to retreat from areas near utility corridors until those areas have been determined safe.

Table ES-3

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Health and Safety (Continued)	Precautions shall be taken to eliminate the possibility of collisions between military vehicles and utility towers. If possible, maneuvers shall be limited in the vicinity of the utility corridor. Large boulders that shall prevent the passage of tracked and wheeled vehicles shall be placed around the base of each of the towers. A restricted zone around the towers shall be marked with flagging or some other obvious device. Soldiers shall be provided with maps showing the exact locations of each of the towers and the associated restricted zones. In the event that heavy vehicles cross the utility corridor, reinforced crossings shall be constructed to reduce the possibility of compromising underground gas pipelines. Helicopter flight routes to access the acquisition areas shall be established to avoid the utility corridors. An electronic tracking system shall be used to prevent inadvertent surface crossing of Highway 127.

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Table ES-4

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
GEOLOGY Landform/ Topography	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
SOILS Significant adverse impacts associated with soil disturbance from military vehicles	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.
Potential significant impacts from disturbance to dry lakebeds	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.
WATER RESOURCES Groundwater	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
Surface Water	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.

Table ES-4

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
BIOLOGICAL RESOURCES						
Plant Habitat	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Significant impacts on Joshua tree woodland and desert sand fields and dunes. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Significant impacts on Joshua tree woodland and desert sand fields and dunes. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Impacts on 741 acres of Joshua tree woodland/ Mojave woody scrub mix. Military vehicles restricted from springs. No significant impacts are expected.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling.	Significant impact on native Mojave Desert vegetation, including a large impact on the Joshua tree woodland community. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Military vehicles restricted from springs; impacts reduced to not significant.
Sensitive Plant Species	Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Impacts on the FSOCs and sensitive species are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Military vehicles will be restricted from springs. Impacts on the FSOCs are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Impacts on two FSOCs are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Impacts on the FSOCs and sensitive species are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.
Wildlife Habitat	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.

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SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Sensitive Wildlife Species Desert Tortoise	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
Other Sensitive Species	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.

Table ES-4

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
CULTURAL RESOURCES Prehistoric - could impact potential NRHP site	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
Historic - could impact potential NRHP site	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
PALEONTOLOGICAL Could impact subsurface paleontological deposits	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
AIR QUALITY	Visibility impacts on Highway 127 reduced to not significant.	Visibility impacts on Highway 127 reduced to not significant.	Dust emission impact remains significant.	Dust emission impact remains significant.	Dust emission impact remains significant.	Dust emission impact remains significant.
NOISE	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
LAND USE Multiple-Use Areas	Impacts on existing BLM multiple-use areas and ACECs remain significant.	Impacts on existing BLM multiple-use areas remain significant.	Impacts on existing BLM multiple-use areas and UPA remain significant.	Impacts on existing BLM multiple-use areas and UPA remain significant.	Impacts on existing BLM multiple-use areas remain significant.	Impacts on existing BLM multiple-use areas remain significant.
Grazing	Loss of 29,200 grazing acres remains significant. No mitigation is required.	Impacts of the loss of 490 grazing acres remain less than significant.	Loss of 60,846 grazing acres and reduction of 50,560 acres of private land in the Western Mojave Land Tenure area remain significant.	Loss of 69,586 grazing acres and reduction of 35,840 acres of private land in the Western Mojave Land Tenure area remain significant.	Loss of 118,106 grazing acres and reduction of 151,680 acres of private land in the Western Mojave Land Tenure area remain significant.	Loss of 41,606 grazing acres and reduction of 51,840 acres of private land in the Western Mojave Land Tenure area remain significant.

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Table ES-4

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
RECREATION Land Sailing	Impact remains the same.	Impact remains the same.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains significant.	No significant impacts are expected. No mitigation is required.
Rock Hounding	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Sightseeing and Camping	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
OHV Use	Impact remains the same.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Horseback Riding	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	No significant impacts are expected. No mitigation is required.
Hunting and Shooting	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
MINING Impact from potential jobs lost	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Significant impact from potential taxes lost	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Significant impact from cost of mine purchase per year	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
UTILITY CORRIDORS	Impacts on 70 square miles of utility corridor remain the same.	Impacts on 12 square miles of utility corridor remain the same.	Impacts on 113 square miles of utility corridor remain the same.	Impacts on 79 square miles of utility corridor remain the same.	Impacts on 42 square miles of utility corridor remain the same.	Impacts on 30 square miles of utility corridor remain the same.

Table ES-4

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
TRANSPORTATION	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	No significant impacts are expected. No mitigation is required.
SOCIOECONOMICS	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
EDUCATION AND RESEARCH	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.
WILDERNESS CHARACTERISTICS Potential significant impact on wilderness values of WSAs	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.
AIR SPACE	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point reduced to not significant.	No significant impacts are expected. No mitigation is required.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point reduced to not significant.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point reduced to not significant.
AESTHETIC RESOURCES	Impact on views along Highway 127 remains significant.	Impact on views along Highway 127 remains significant.	Impact on views along I-15 remains significant.	Impact on views along I-15 remains significant.	Impacts on views of Lane Mountain reduced to not significant.	No significant impacts are expected. No mitigation is required.
SOLID AND HAZARDOUS WASTE	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.

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Table ES-4

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
HUMAN AND HEALTH SAFETY Potential safety hazards from military operations in utility corridors and in close proximity to highways	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.

SECTION 1 - INTRODUCTION

1.1 BACKGROUND

This Draft Environmental Impact Statement (DEIS) addresses the environmental impacts associated with the U.S. Department of the Army's proposed acquisition of additional lands for the National Training Center (NTC) at Fort Irwin. This acquisition is proposed to fulfill the NTC's mission training requirements to provide realistic combat training on a brigade training basis. The NTC encompasses approximately 642,000 acres in eastern San Bernardino County near Barstow, California. Figure 1.1-1 illustrates the general geographic setting of the facility.

Because both the Proposed Action and alternatives involve land currently administered by the Bureau of Land Management (BLM, California Desert District) or lands previously withdrawn from the BLM for military purposes, the BLM is the Lead Agency. The Army is a Cooperating Agency. Because some alternatives involve airspace under the jurisdiction of the U.S. Air Force (USAF), it is also a Cooperating Agency.

The NTC is the primary training center in the United States for U.S. Army armored units. It provides training for brigade-sized armored units and supporting ground units. These units engage in realistic battle scenarios against an "opposing force" trained in Soviet-style aggressor battle tactics and permanently stationed at the NTC. The battle doctrine known as Joint Operations was used successfully in Operation Desert Storm and is practiced at the NTC. It is anticipated that most of the potential opposing forces that may be encountered in real combat in the foreseeable future will use Soviet-style battle tactics. Therefore, the significance of training at the NTC takes on an even greater military importance to ensure the optimum readiness, effectiveness, and safety of U.S. soldiers.

The increased sophistication and speed of modern armored vehicles, such as the Abrams Main Battle Tank (M1A1), require large expanses of land for realistic battle scenarios. Current training operations of the NTC are hindered by lack of realistic distances between the forward combat groups and the rear supporting and logistic groups. Land Use Requirements Studies (LURS, Appendix A) conducted by the U.S. Department of the Army in 1985 and 1993 concluded that additional maneuverable acres are required to provide adequate training areas at the NTC.

Several expansion alternatives for the NTC are analyzed in detail in this DEIS. These alternatives are summarized in Table 1.1-1. The Proposed Action (Silurian Valley Alternative) involves acquiring approximately 331,217 acres within a portion of the Silurian and Valjean Valleys and Soda Mountains east of the present NTC boundaries. Other alternatives involve various scenarios of acquiring of lands to the south, east, southwest, or southeast of the current NTC boundary. The No Action Alternative is no geographic expansion of the NTC.

Table 1.1-1

SUMMARY OF LAND OWNERSHIP FOR EXPANSION ALTERNATIVES (acres)

Alternative	Public	Private	State, Local	Total
Proposed Action	310,296	5,148	15,773	331,217
Modified Avawatz-Silurian	253,300	4,380	12,350	270,030
Modified Coyote Basin	196,914	57,811	4,745	259,470
Alvord	168,700	37,300	4,800	210,800
Superior Valley	202,254	79,300	3,331	284,885
Avawatz	137,600	45,900	2,000	185,500

This DEIS provides a detailed description of the Proposed Action and alternatives, including the No Action Alternative, in Section 2. A description of the affected environment, including the existing conditions of all areas encompassing an alternative, is provided in Section 3, and a detailed impact analysis of each alternative is presented in Section 4. Measures to

mitigate the impacts of each alternative are also provided in Section 4. The DEIS will be distributed to agencies and the general public for review and comment. After a 90-day public review and comment period, including public meetings, any comments received will be considered and addressed in the Final EIS (FEIS).

1.2 PURPOSE AND NEED

1.2.1 Purpose

The purpose of the Proposed Action is to acquire additional maneuverable land to enable the NTC to conduct its mission of training U.S Army brigade-sized units in combined, realistic arms, Joint Operations, and field training.

The existing total acreage occupied by the NTC is inadequate to provide realistic combat scenarios for a modern, 21st Century Army. The land expansion project will allow Army unit commanders the flexibility, initiative, tailorability, and versatility to train their units in accordance with present and future Army joint and combined arms operations doctrines.

Fort Irwin's boundaries were initially established in 1940 for use during World War II as an antiaircraft weapons range. After periodic inactivity, the NTC was established in 1981 within these same 1940 boundaries.

1.2.2 Need

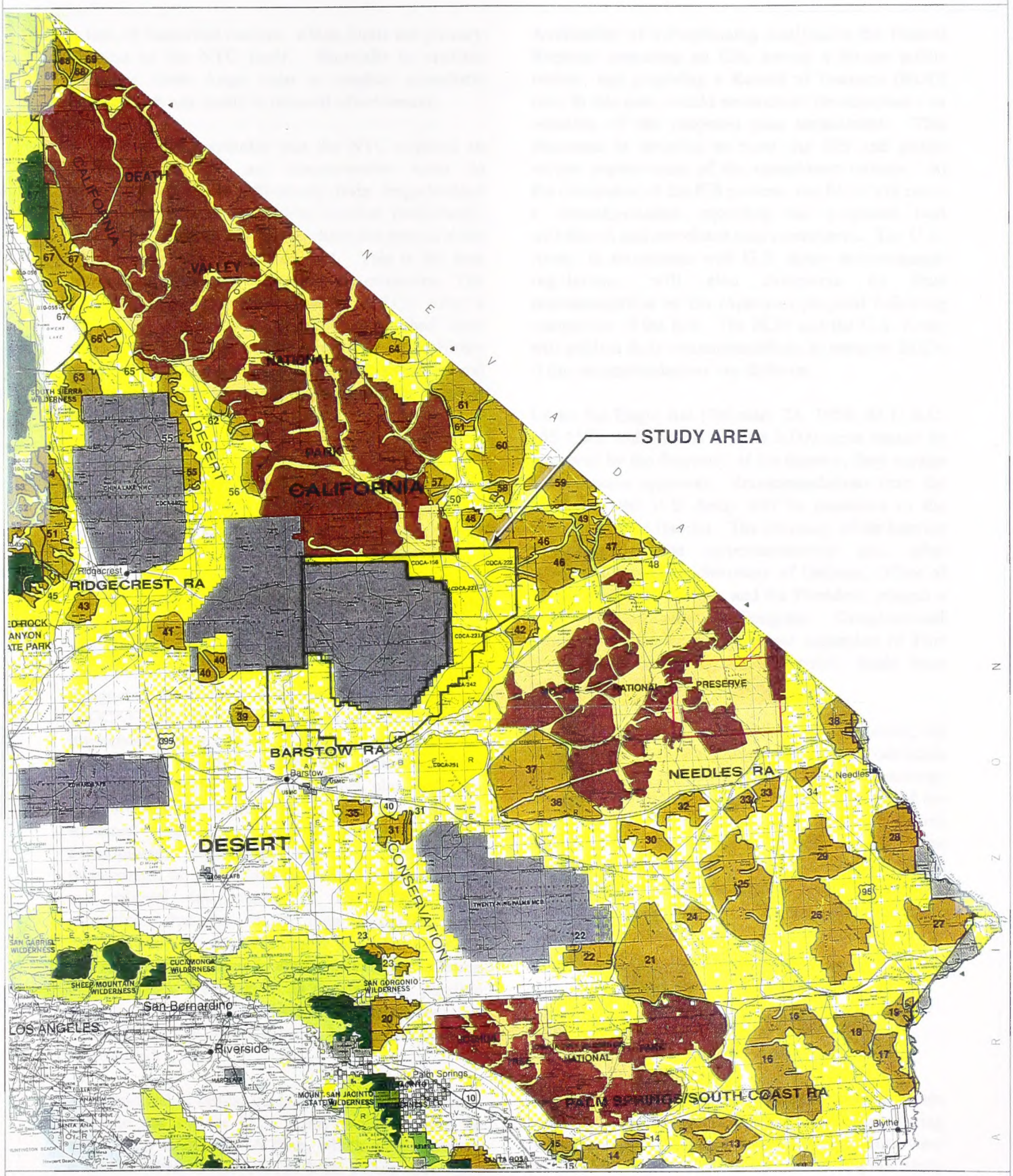
The maneuverable land available at the NTC is inadequate to satisfy the characteristics of the U.S. Army's Joint Operations training doctrine. The training principles contained in this doctrine are fundamentally based on the ability of combat forces to maneuverable on the battlefield. A major ramification of a lack of maneuver space is that commanders and support elements are not allowed to realistically train under the most important component of combat support: time/distance. Within the current NTC boundaries, rear assembly, logistics, and support bases are located much closer to the main battle area than would be the case under actual combat conditions. Furthermore, the supply bases themselves are more vulnerable to attack by the enemy than would normally be the case in combat. Awkward unit alignments, caused by the limited terrain available at the NTC, find opposing lead elements starting next to friendly rear elements.

Commanders are not confronted by the practical time/distance challenges that they are certain to face on any future battlefield. Additional maneuverable land is needed to overcome these shortfalls.

In 1981, when the NTC began operations, Army tactics were structured around the M6OA3 tank, the M113 armored personnel carrier, the M109 howitzer, and the AH-1 Cobra attack helicopter. The M6OA3 tank could effectively engage targets out to a range of 1.25 miles, the Cobra helicopter out to 1 mile, and the M109 howitzer out to just over 12 miles. The operational pace at which tactical operations could be conducted was between 5 and 10 miles per hour (mph). Doctrine was centered on the active defense focused on a European scenario that was defensive in nature. The focus of tactical operations was the battalion consisting of 24 tanks, 4 antiarmor missile systems, and 18 howitzers. Only one battalion trained at the NTC at any one time.

From 1986 to 1990, the Army underwent a significant modernization effort. The Ml Abrams tank, M2 Bradley fighting vehicle, Apache helicopter, Paladin artillery piece, and the Multiple Launch Rocket System (MLRS) were fielded. The effective range at which targets could be acquired, engaged, and destroyed increased to 2 miles for the tank, 9 miles for the Apache helicopter, 18 miles for the Paladin, and over 60 miles for the MLRS. The M2 Bradley gave the infantryman, for the first time, a long-range nonmissile tank killing capability. Doctrinally, the Army adopted the Airland Battle philosophy that, although still focused on a European scenario, was both offensive and defensive in nature. With the fielding of the Ml tank and M2 fighting vehicle, the operational pace at which tactical operations could be conducted increased dramatically to over 35 mph. The focus of tactical operations shifted from a single battalion to multiple battalion/brigade level operations consisting of 58 tanks, 58 Bradley fighting vehicles, 58 antiarmor missile systems, 24 howitzers, and 18 Apache helicopters. Today, six to nine battalions, under the control of a brigade headquarters, train at the NTC each rotation.

While weapons systems and tactics are ever improving and changing, the amount of maneuverable space at the NTC has remained fixed. This limited amount of usable land upon which to train modern units results in



N Not to Scale

REGIONAL MAP: NATIONAL TRAINING CENTER AND THE STUDY AREA
Figure 1.1-1

a lack of battlefield realism, which limits the primary mission of the NTC itself. Shortfalls in credible scenarios force Army units to conduct unrealistic training that can result in reduced effectiveness.

A 1985 LURS concluded that the NTC required an additional 238,000 net maneuverable acres in operational lands to effectively train brigade-sized maneuverable units to achieve combat proficiency. Maneuverable lands are found where the ground slope (or grade) is less than 20 percent. This is the area where combat vehicles can effectively maneuver. The LURS was updated in 1993 because the U.S. Army's Training Circular 25-1, Training Land, had been revised in 1991. The update (Appendix A) reaffirms the 1985 finding and concludes that 222,000 additional net maneuverable acres are required for the average unit training at the NTC.

1.3 CALIFORNIA DESERT CONSERVATION AREA PLAN/ LAND WITHDRAWAL PROCESS

The majority of the lands within the study area (encompassing all analyzed alternatives) are public lands under the management authority of the Secretary of the Interior delegated to the BLM. The Federal Land Policy and Management Act (FLPMA) of 1976 designated the California Desert Conservation Area (CDCA) and directed the BLM to prepare and implement a comprehensive, long-range plan for the management, use, development, and protection of the public lands within the CDCA: "Such plan shall take into account the principles of multiple use and sustained yield in providing for resource use and development, including, but not limited to, maintenance of environmental quality, rights-of-way, and mineral development." The CDCA Plan recognizes that the BLM must maintain close coordination with the Department of Defense (DOD) and local military bases to ensure that implementation of the CDCA Plan will be as consistent as possible with the mission of these bases. The study area lies within the CDCA and is covered by the CDCA Plan, as amended.

A withdrawal of public lands from BLM management for sole use by the U.S. Army would require an amendment to the CDCA Plan, which would remove a specific area of the CDCA from public use. The amendment process requires a number of steps, including publishing a Notice of Intent and Notice of Availability of a Preplanning Analysis in the Federal Register, preparing an EIS, having a 90-day public review, and preparing a Record of Decision (ROD) that, in this case, would recommend the acceptance or rejection of the proposed plan amendment. This document is intended to meet the EIS and public review requirements of the amendment process. At the conclusion of the EIS process, the BLM will reach a recommendation regarding the proposed land withdrawal and associated plan amendment. The U.S. Army, in accordance with U.S. Army environmental regulations, will also determine its final recommendation on the expansion proposal following completion of the EIS. The BLM and the U.S. Army will publish their recommendations in separate RODs if the recommendations are different.

Under the Engle Act (February 28, 1958; 43 U.S.C. 155-158), withdrawals of over 5,000 acres cannot be approved by the Secretary of the Interior; they require congressional approval. Recommendations from the BLM and the U.S. Army will be presented to the Secretary of the Interior. The Secretary of the Interior will consider the recommendations and, after coordination with the Secretary of Defense, Office of Management and Budget, and the President, present a final recommendation to Congress. Congressional action to implement the proposed expansion of Fort Irwin would withdraw affected public lands from public use and amend the CDCA Plan.

The study area consists of public lands. However, the checkerboard pattern of public, state, and private lands precludes the expansion onto adequate acreage managed or owned by a single entity. Because of the large amount of public lands and the checkerboard pattern of land ownership, a decision to disallow the acquisition of these public lands for military use would preclude acquiring other nonpublic lands. Conversely, a decision by Congress to withdraw public lands for military use would facilitate the acquisition of intermingled state and private lands.

1.4 PRELIMINARY SCOPING PROCESS AND ISSUES

The initial scoping period consisted of a series of six public scoping meetings held in five cities during September 1988. Further scoping opportunities were provided in August 1990 to update the original study area, in February 1992 for the Silurian Valley Alternative (Proposed Action), and February 1993 for

consideration of Navy lands. A number of issues have been identified and considered for investigation in this DEIS as a result of both initial resource studies and public participation through the public scoping periods. These issues reflect current public, BLM, and Army management concerns. The following issues are addressed in this DEIS:

- wildlife resources;
- mining on public and private lands;
- utility corridors;
- wilderness characteristics;
- soils;
- vegetation;
- air quality/dust generation;
- airspace;
- cultural, historic, and paleontological resources;
- livestock grazing;
- visual resources;
- water resources;
- land ownership;
- recreation (rock hounding, land sailing, off-highway vehicle [OHV] use, camping and sightseeing, hunting and shooting, and horseback riding);
- use and occupancy of private lands (residency, agriculture, religious, and organizational uses, and development of private lands);
- local communications utility facilities;
- transportation and access;
- education and research;
- solid waste and hazardous substances;
- social and economic considerations of changes in employment at NTC; and
- health and safety.

A list of other public scoping concerns is provided in Section 7. A complete scoping meeting report dated November 1988, prepared by Sharon Clark Associates, is on file at BLM's Barstow Resource Area office.

SECTION 2 - ALTERNATIVES

2.1 INTRODUCTION

This section provides a discussion of the alternative plans investigated for land acquisition for the NTC, including the No Action Alternative. A summary is given of the plan formulation process undertaken by the BLM and the U.S. Army. A description of the Proposed Action is outlined in Section 2.3 and includes the planned use for expansion lands and the land withdrawal/acquisition process. Alternatives carried forward for detailed analysis, as well as alternatives eliminated from further analysis, are also presented. The Proposed Action of the U.S. Army is the Silurian Valley Alternative, which constitutes the Proposed Plan Amendment under consideration by the BLM. At this time, the BLM has not yet identified an Agency Preferred Alternative. The BLM will use the analysis presented in the DEIS and Proposed Plan Amendment, public comments received during the 90-day public review period, and comments from other agencies before identifying and presenting its Agency Preferred Alternative in the FEIS and Proposed Plan Amendment.

2.2 ALTERNATIVE FORMULATION PROCESS

The formulation of alternatives to meet the NTC's training needs has followed a process that has involved participation by the U.S Army, the BLM, and other concerned agencies and the public. Several alternatives were developed and evaluated based on the current NTC training deficiencies and shortfalls identified in the LURS, environmental considerations and constraints, assessment of impacts on mission and resource requirements, and other concerns expressed by agencies and the public. The alternatives described in this section include a range of considerations, including, but not limited to, redesign or reconfiguration of training options and ranges at the existing NTC to avoid and/or minimize land acquisition for expansion, transfer of training units or other mission changes, acquisition of land both contiguous and not contiguous to the existing installation, use or expansion of other military training locations, and no action.

The U.S. Army identified its Proposed Action as the Silurian Valley Alternative after evaluation of the alternatives described herein. Briefly, preliminary alternatives developed in the mid- to late-1980s by installation/training planners were refined and supplemented by the BLM and reviewed by the public. These were subsequently evaluated and screened and are presented in following discussions of the alternatives carried forward for detailed analysis and those that were eliminated from such assessment. During this process, the U.S. Fish and Wildlife Service (USFWS) listed the desert tortoise as a threatened species (in April 1990). The U.S. Army and BLM decided to modify the process to consult with the USFWS and evaluate the related impacts and add and/or refine alternatives to avoid or minimize the adverse impacts on the tortoise to the maximum extent practicable. Through this process and consultation with the USFWS, the Proposed Action was developed and refined.

Efforts to formulate alternatives began with initiation of the process used by the U.S. Army for determining whether current land holdings at an installation are enough to support specific training missions. A LURS is prepared to quantify training land requirements and document shortfalls or deficiencies. If a deficiency exists, then an analysis is conducted to address alternatives and recommendations to reduce or eliminate the deficiency, including considerations of environmental factors and optimization of existing facilities. If, after considering all alternatives, a decision is made to acquire additional land, then an environmental evaluation is prepared to assess the level of environmental impact. This EIS documents the NTC's compliance with the procedure. Results of the LURS are included in Appendix A.

The formulation and evaluation of alternatives for the proposed land acquisition included the following considerations:

- ensure that the planning process integrates mission and environmental considerations;
- encourage interagency coordination and public participation early and throughout the planning process;

- incorporate the training and maneuverable area requirements identified in the LURS;

- ensure that size, shape, and configuration of alternatives are adequate to support and apply the Joint Operations Doctrine (e.g., provide sufficient spaces and realistic distances for battlefield and air maneuvers, operations and support units, sufficient terrain diversity, access and proximity to airfields, rail systems, and roadways);

- consider constraints such as unusable land (e.g., steep slopes, proximity to encroaching communities and utility corridors) and sensitive environmental resources such as critical habitat, wilderness areas, recreation areas, and historic and cultural resources;

- consider availability of land contiguous to existing installation and training devices/facilities such as battlefield and weapon simulators, sophisticated communications systems, and firing and multipurpose nonfiring ranges; and

- ensure compliance with applicable environmental laws, regulations, and policy.

The U.S. Army first presented its proposal for expansion of the NTC to BLM in June 1988 and requested assistance from BLM in the development of alternatives based on public land use and natural resource issues. The BLM suggested alternatives to avoid specific areas and suggested where other areas could be removed from consideration in their entirety if the needs and objectives of the U.S. Army could continue to be met. New alternatives were then developed to analyze potential expansion areas that would exclude the Boulder and I-15 Utility Corridors and three Wilderness Study Areas (WSAs). The study area was refined to exclude environmentally sensitive areas such as Black Canyon, Inscription Canyon, Calico Early Man Site, and Cronese Lake; Black Mountain WSA; and Opal Mountain, Rainbow Basin, and Owl Canyon recreation areas.

During the public scoping period, concerns were raised by the former George Air Force Base (AFB), the Air Force Flight Test Center (AFFTC) at Edwards AFB, and Naval Air Weapons Station, China Lake (NAWS) regarding aircraft flight corridors within or adjacent to the study area. In particular, the concern focused on potential mission conflicts between NTC rotations (including USAF training support) and airspace uses in the corridors that are not a part of USAF NTC rotation involvement. Consultation and coordination with George and Edwards AFBs and NAWS resulted in the formulation of a new alternative for inclusion in the analysis that addresses the locations of flight corridors. This resulted in the development/review of the Avawatz Alternative, which would minimize the conflicts between military airspace use.

In 1989, the desert tortoise was emergency listed by the USFWS and was subsequently listed as threatened in April 1990. Minimization of impacts on the tortoise became a paramount issue. The NTC developed an alternative, termed the Modified Coyote Basin Alternative, that preserved extensive tortoise populations in the western portion of the Coyote Lake Basin when compared to the Coyote Alternative. A Biological Assessment was prepared in 1991 and submitted to the USFWS in compliance with Section 7 of the Endangered Species Act. In its Draft Biological Opinion (September 21, 1991), the USFWS determined that the Modified Coyote Basin Alternative would place the existence of the desert tortoise in jeopardy. The USFWS identified the following reasonable and prudent alternatives:

1. a. Acquire and conduct training exercises only in that portion of the Modified Coyote Basin Alternative east and north of the Soda Mountains and relocate the existing cantonment area and ranges to nondesert tortoise habitat either within or outside of the existing NTC. The abandoned agricultural land near Harvard would be a potential relocation site for cantonment facilities.

   OR

   b. Develop and analyze an additional expansion alternative that would extend from the east face of the Soda Mountains northeast into the Silurian Valley.

   AND

2. Reduce the take of individual desert tortoises in areas that would be affected by the previous reasonable and prudent alternatives through a combination of measures, including habitat protection and translocation of animals to protected areas on the NTC.

The Proposed Action follows the intent of element 1(b) of the identified reasonable and prudent alternative. A Revised Biological Assessment was prepared in 1992 (Appendix B).

It was originally proposed to include 160,225 acres within the central portion of the Mojave B Ranges administered by the NAWS in addition to the Silurian Valley study area. The USFWS prepared a Final Biological Opinion on this alternative on April 29, 1994 (Appendix C). The NAWS determined that the joint use of the area by both the Army and the Navy would significantly impact the current NAWS mission. Based on this assessment, this alternative was not carried forward for detailed analysis.

2.3 DESCRIPTION OF PROPOSED ACTION

The NTC Proposed Action (the Silurian Valley Alternative) involves acquisition of lands for the NTC in the Silurian Valley/Valjean Hills and Soda Mountains. The characteristics of this alternative are discussed below.

2.3.1 Location and Project Description

The proposed acquisition area encompasses areas adjacent to Fort Irwin and extends primarily to the north and east. The area consists of approximately 331,217 acres, which would result in the provision of the 277,244 net maneuverable acres (acres with 20-percent slope or less) required to support the NTC training mission. Ownership categories of these lands are as follows:

- 310,296 acres managed by the BLM to be withdrawn from Public Domain through Engle Act legislation,
- 15,773 acres owned by the State of California proposed for purchase, and
- 5,148 acres of privately owned land proposed for purchase.

Figure 2.3-1 shows Fort Irwin and the proposed acquisition area. The lands north and northeast are sought in order to provide a northern access corridor around the Avawatz Mountains. A 24,500-acre area is also proposed for acquisition along the northern border of the NTC and the Death Valley National Park to serve as a buffer area between NTC and the Park.

Figure 2.3-2 shows the study area (which includes the proposed acquisition area and alternative areas) with shading in those areas consisting of greater than a 20-percent slope. Those areas of the Proposed Action with 20-percent slope or less (277,244 acres) generally correspond to the primary maneuvering areas for tanks. Areas with slopes between 20 and 40 percent (39,816 acres) could still be used by tanks on an infrequent basis and for other uses such as field reconnaissance and communication activities. Areas with slope greater than 40 percent constitute nonmaneuverable lands (14,157 acres). The net maneuverable lands (20-percent slope or less) within this alternative constitute approximately 277,244 acres. This total maneuverable area is 53,973 acres larger than the 222,000 net maneuverable acres specified in the 1993 LURS.

Current land uses within the proposed acquisition area include the following:

- Only one mine in the study area (the Iron Mountain Mine) located in the southern Avawatz Mountains is producing ore. This mine produces iron ore at a rate of 50,000 tons per year. Exploratory drilling is underway in a claim group on the south side of the Silurian Hills, and several firms have expressed interest in conducting exploratory investigations in the Silurian Hills along the eastern boundary of the Proposed Action. A number of large inactive and abandoned mining operations are located in the Avawatz Mountains, Silurian Hills, and scattered areas in the Silurian Valley.
- A major utility transmission corridor (Boulder Corridor) runs through the southern and eastern Silurian Valley portions of the study area. Those study lands east of the corridor are intended for logistical support and administrative uses, not force-on-force tactical maneuvering.
- A natural gas pipeline parallels the Boulder Corridor.
- Dispersed recreation (rock hounding, sightseeing, and limited OHV) occurs mostly in the Silurian Valley portion of the study area.
- California Highway 127 bisects the Silurian Valley portion of the study area. Training on

both sides of the highway is planned with approximately six specifically constructed undercrossings for tracked vehicles.

- Death Valley National Park lies adjacent to a portion of the northern boundary of the study area.
- A portion of the Amargosa River drainage lies within the northern boundary of the study area.
- The Cronese Basin Area of Critical Environmental Concern (ACEC) adjoins the southeastern corner of the study area.
- The Salt Creek and Denning Springs ACECs are located within the northern boundary of the study area.
- All or portions of five legislatively designated WSAs lie within the area: Avawatz Mountains, South Avawatz Mountains, Soda Mountains, Death Valley National Park Boundary, and Kingston WSA.

Private lands are scattered throughout the Silurian Valley portion of the study area. They mostly coincide with the mining claims that occur in the area. Very few actual dwellings occur within the study area. Private lands encompass approximately 5,148 acres (2.1 percent) of the land proposed for acquisition.

State lands generally appear as a checkerboard pattern throughout the Silurian Valley. These lands comprise approximately 15,773 acres (5.3 percent) of the study area. The California State University System has a research facility located at Sheep Creek Springs and is managed by the Desert Studies Consortium.

2.3.2 Planned Use

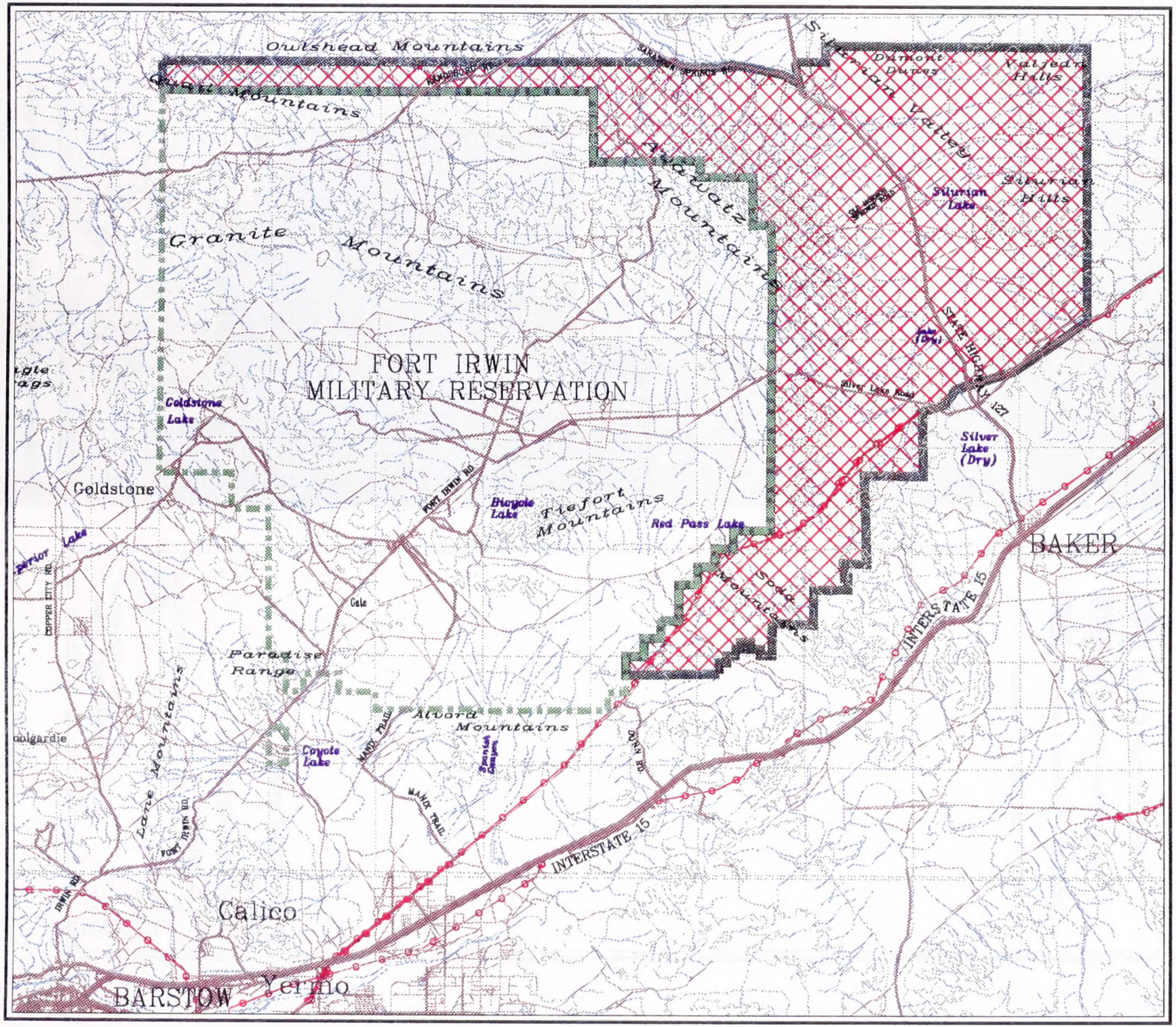
2.3.2.1 Personnel and Equipment

The NTC is home to the Opposing Force Regiment (OPFOR), Operations Group, the NTC Garrison, and Medical Activity (MEDDAC). Current Army Standard Installation Planning (ASIP) strength is approximately 4,300, and the future shows it growing to over 4,700. Since its beginning in 1981, the importance of the NTC mission has continually resulted in assigned strengths exceeding authorized strengths. The NTC is presently home to a military population of 4,636. Former Base Realignment and Closure (BRAC) commission directives may force the installation to grow even larger as regional missions are added when installations in the West close (e.g., Fort Ord and recruiting activities in Los Angeles). When combined with military families and civilian and contractor employees, the NTC is a small city of 12,000.

The mission of the NTC is to provide tough and realistic combined arms and services training in accordance with the Joint Operations Doctrine for brigades and regiments in a low-, mid-, and high-intensity environment while retaining the training feedback and analysis focus at Battalion/Task Force level and to provide a data source for training doctrine, organization, and equipment improvements. This training involves the rotation of various units into the NTC on 28-day intervals to conduct realistic battle training in simulated force-on-force and live-fire exercises. Three elements are associated with this training: the OPFOR stationed at NTC battles the rotational units, the Observer Controllers (OC) soldiers stationed at NTC providing feedback for the battles, and the rotational soldiers themselves.

The primary OPFOR at the NTC is the 11th Armored Calvary Regiment (ACR), which is permanently stationed at Fort Irwin. The OPFOR is thoroughly trained and operates at the regimental, company, and mission level using the organization, tactics, and doctrine of a Soviet-style motorized rifle regiment. The OPFOR would, as is the present situation, engage in enacted combat situations with a rotational brigade. When required for simulating a larger OPFOR, either Regular Army, National Guard, or Reserve units deploy to the NTC to augment the 11th ACR. The approximate number of OPFOR soldiers participating in most exercises is 5,000.

The NTC training operations also include OC soldiers who come from the NTC Operations Group permanently stationed at NTC. The mission of the OC is to follow the battles and advise the rotational units on how to improve their battle tactics. The OC soldiers spend time in the field with the rotational unit observing, analyzing, and counseling on unit performance throughout the planning, preparation, and execution of all missions. In addition, the OC soldiers ensure that the multiple integrated laser engagement system (MILES) equipment (discussed later in this section) is battle-ready at all times and apply simulated battlefield effects by assessing in the field or



Explanation

- Proposed Action
- Power and Transmission Lines

Final Consideration
PROPOSED ACTION
(Silurian Valley Alternative)

Figure 2.3-1

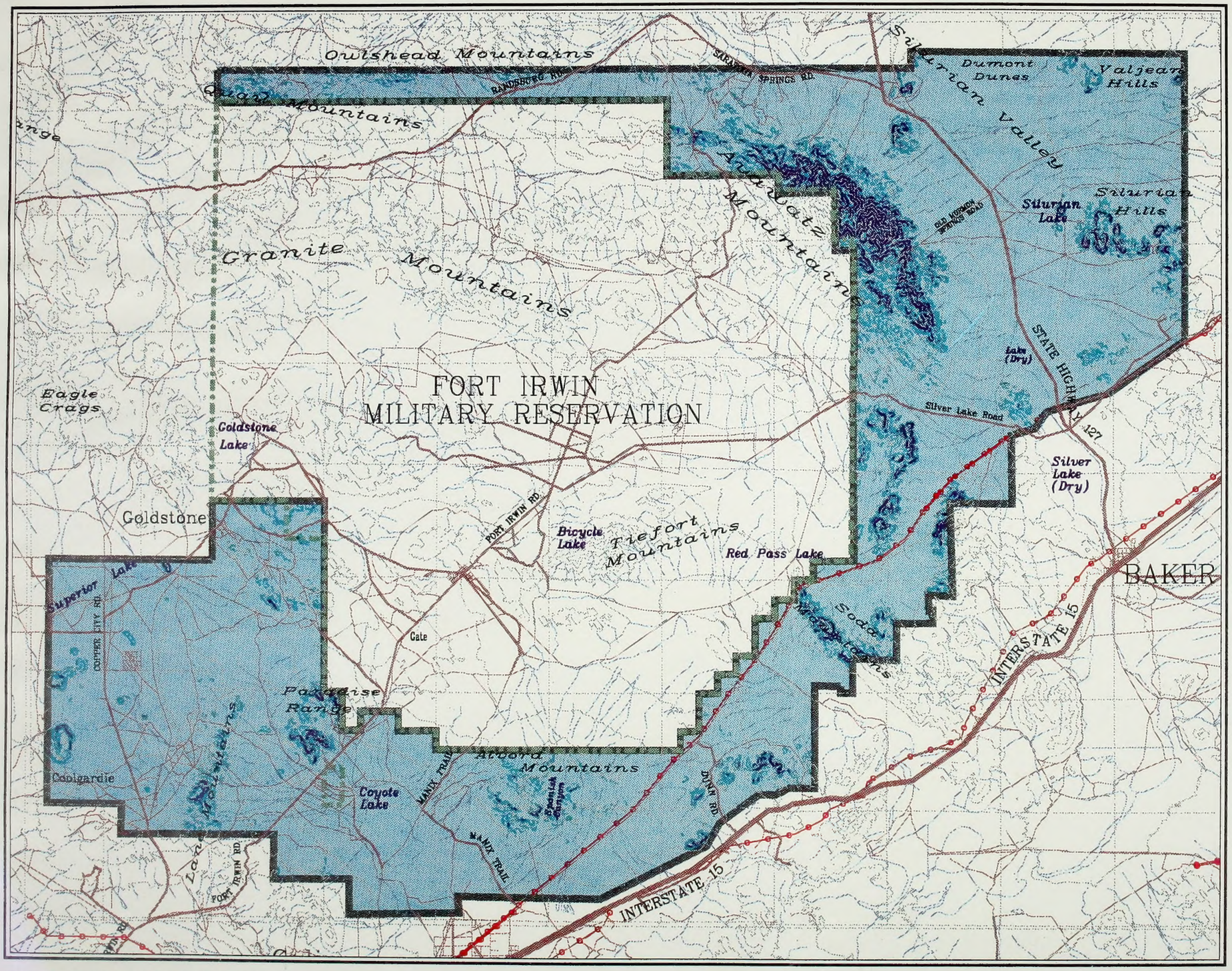
Chambers Group, Inc.

Project# 6347

MAP SCALE 1" = 40000'

5 2.5 1.25 0 5 Miles

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Explanation

- 0 to 20 Percent Slope
- 20 to 40 Percent Slope
- Greater than 40 Percent Slope
- Power/Transmission Lines

Entire Study Area
SLOPE CLASSIFICATIONS
Figure 2.3-2

Chambers Group, Inc.

5 2.5 1.25 0 5 Miles

1" = 30000'
Project# 6347
November 22, 1996

November 22, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

incorporating system assessments previously described, casualties from "mines," artillery, air strikes, and chemical warfare. The approximate number of OC soldiers participating in an expanded rotation may reach over 1,200, depending on the size of the rotational forces.

In the last few years, the mission of the NTC has expanded to include the responsibility of training brigade-sized forces. This includes the simultaneous training of ground maneuver brigades and Army aviation brigades. Whereas most rotations numbered no more than 5,000 soldiers, the NTC is required to train units with well over 10,000 soldiers occasionally. Each rotation is approximately 28 days with 12 rotations per year. In general, soldiers and their military equipment (vehicles, helicopters) are brought in by air transport to the former George AFB. The soldiers are bused and their vehicles driven to Fort Irwin for their scheduled military exercises. The helicopters are assembled at one of the airheads and flown directly to the NTC. The heavy armored vehicles are shipped via rail to Yermo.

The OPFOR, OC, and rotational units (BLUFOR) use a wide variety of both tracked and wheeled vehicles. These vehicles include the M1A1 tanks, the Bradley Infantry Fighting Vehicles (MS), and armored personnel carriers and supply vehicles. OPFOR uses both Soviet- and American-made tanks that have been modified to resemble Soviet tanks. It should be noted that even though the former Warsaw Pact forces are not now a major threat to national security, most other potential combatants could use both Soviet equipment and tactics. Table 2.3-1 details the approximate number of vehicles used by each of these units during a typical exercise.

Approximately 4 times per year, airborne elements consisting of 400-500 light infantry soldiers also participate in training maneuvers at the NTC. These units train in conjunction with mechanized units during normal rotations. The primary training mission of the airborne units is insertion exercises. As such, these units will maneuver within the existing NTC boundaries and have no impact on the expansion area.

U.S. Army aviation brigades presently participate and would continue to participate in rotation exercises. U.S. Army aviation engages in both force-on-force and live-fire exercises. Rotational brigades currently bring with them approximately 34 aircraft consisting of AH-64 (Apache), AH-1 (Cobras), OH-58 (Bell Jet Ranger), UH-1 (Huey), and CH-47 (Chinook). With an expanded brigade, approximately 46 aircraft of the types previously listed could participate. Army aviation participates in force-on-force exercises using the Air to Ground Engagement System II (AGESII) to replicate weapons effects. In live fire, Army aircraft use the full spectrum of weapons to include the HELLFIRE antitank missile, rockets, and cannon fire. The OPFOR currently, and with expanded rotations, uses approximately four UH-1 (Huey) aircraft, which are visually modified to replicate Soviet aircraft. Table 2.3-1 provides an estimate of aircraft use during exercises.

The USAF and the U.S. Army aviation forces provide close air support of the rotational exercises. The joint training involves the 9th and 12th Air Forces, Air National Guard, and Air Force Reserve. Participating USAF wings and squadrons come from throughout the United States and rotate in to the Air Warfare Program at Nellis AFB, near Las Vegas, Nevada, in the same time sequence as the U.S. Army rotations through NTC. Typically, an A10 Thunderbolt II unit deploys, joined by a second unit flying F16 Fighting Falcon aircraft. A third unit is equipped with OA37 Dragonfly or other type aircraft. The rotation soldiers are usually supported by A10 aircraft, while the opposition forces are supported by either OA37, A-7, F-4, or F-16 aircraft. Air Force aircraft participate in both force-on-force and live-fire exercises. In force-on-force, the aircraft use the USAF's Aircraft Maneuver Instrumentation (ACMI) system for assessment of weapons effects. In live fire, aircraft drop live ordnance, including laser-guided, 2,000-pound bombs, rockets, and cannon fire. The USAF also provides electronic warfare (EW) aircraft (COMPASS CALL) to conduct EW.

2.3.2.2 Training

Battle Scenarios

Figure 2.3-3 provides a general layout of the brigade-sized battle scenarios conducted within the current NTC boundaries. All of the battle scenarios in the expanded NTC will be similar in that the major portion of the actual battles will occur within existing NTC boundaries. Figures 2.3-4 and 2.3-5 show alternative battle scenarios for the expanded NTC support bases, and combat unit assembly areas for the rotational unit would be placed further back into the Silurian Valley. This will provide a more realistic time/distance factor for commanders. Some of the potential training scenarios may also allow for the simultaneous training

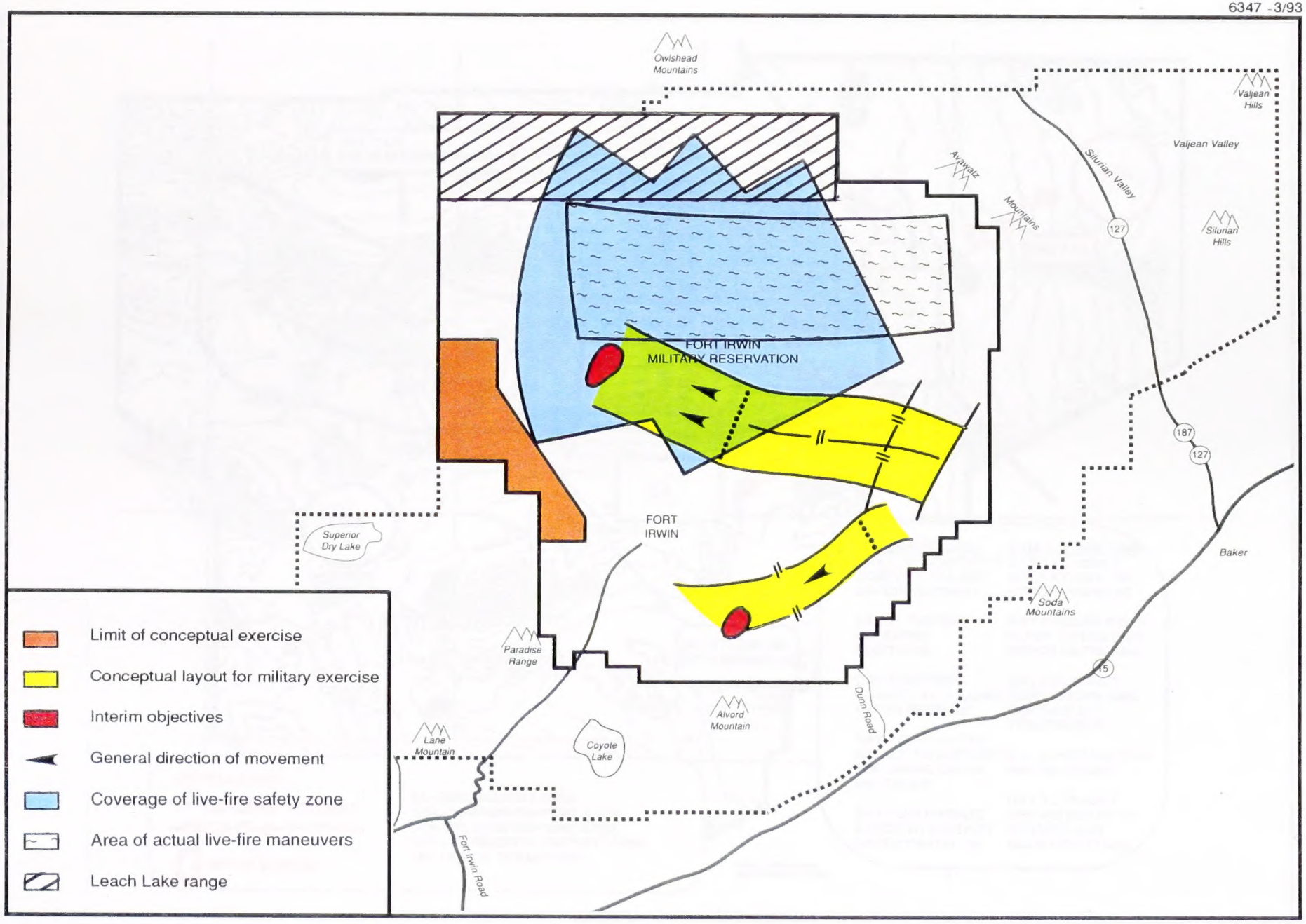
Table 2.3-1

SUMMARY OF EQUIPMENT USED AT NTC DURING A TYPICAL EXERCISE

Type	Number
OPFOR (Stationed at NTC)	
Tracked Vehicles (on M551 chassis)	179
Wheeled Vehicles (on M998 chassis)	42
Tracked Engineer Vehicles (all types)	17
Soviet Equipment	
Tracked	17
Wheeled	8
OC Equipment (Stationed at NTC)	
M113 APC	45
M578 (Recovery)	2
M998, HMMWV	454
Typical Rotational Brigade	
Tracked Vehicles	
M1A1 (Abrams) Tank	80
M2 (Bradley) Infantry Fighting Vehicle	80
All Other Types	174
Wheeled Vehicles (All Types)	850
Aircraft	
Helicopters	
Cobra/Apache	18
Observation (OH-58)	30
Utility (UH-1H/UH-60)	46
Medium Lift (CH-47)	4
Fixed Wing	
Cargo (C-130/C-141/C-5B)	20
Attack/Fighter (A-10/F-16)	24

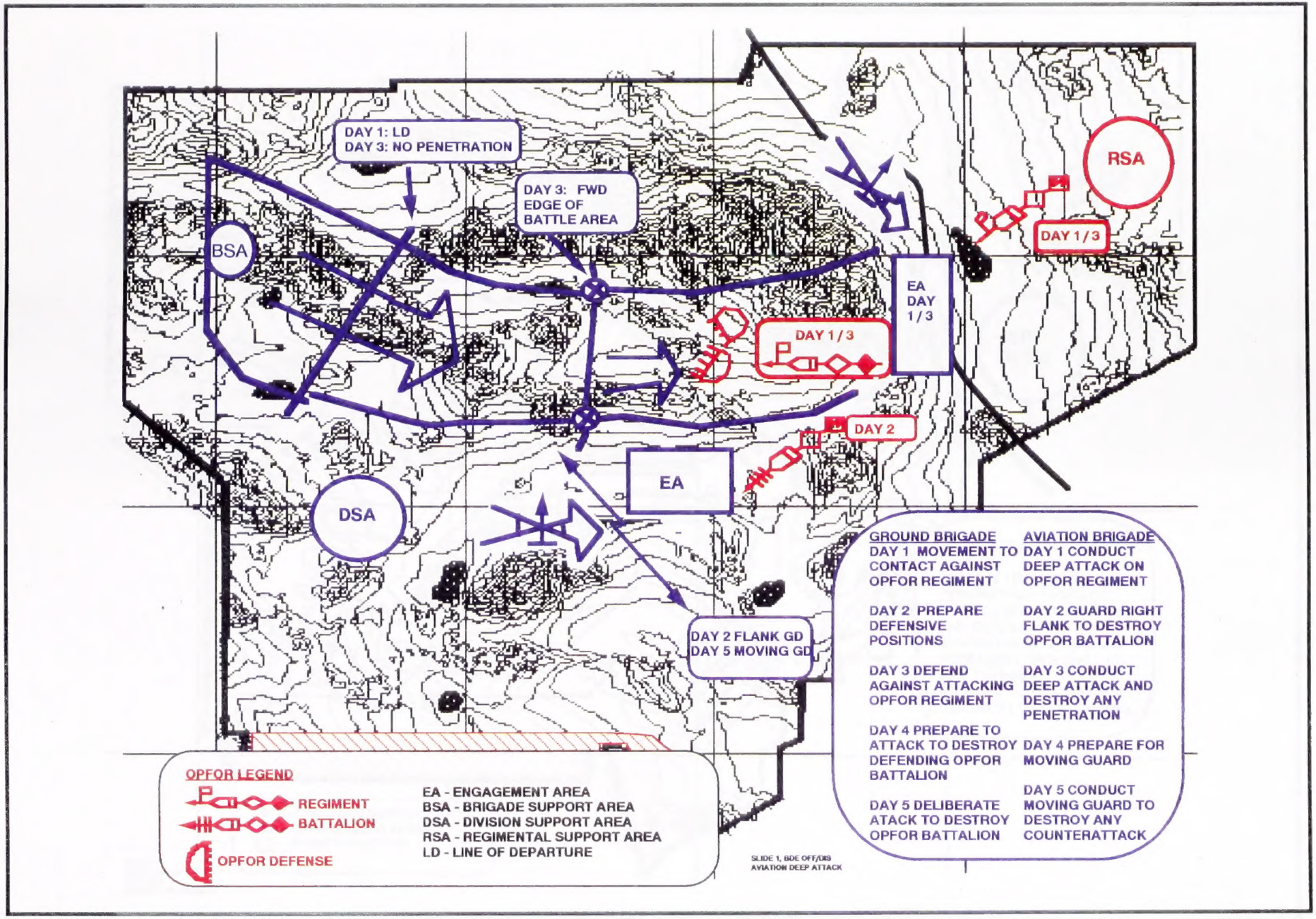
Note: Typical exercise applies to all alternatives. It is expected that no significant equipment change would result from implementation of the Proposed Action or any other alternative.

OPFOR = Opposing Force OC = Observer Controller

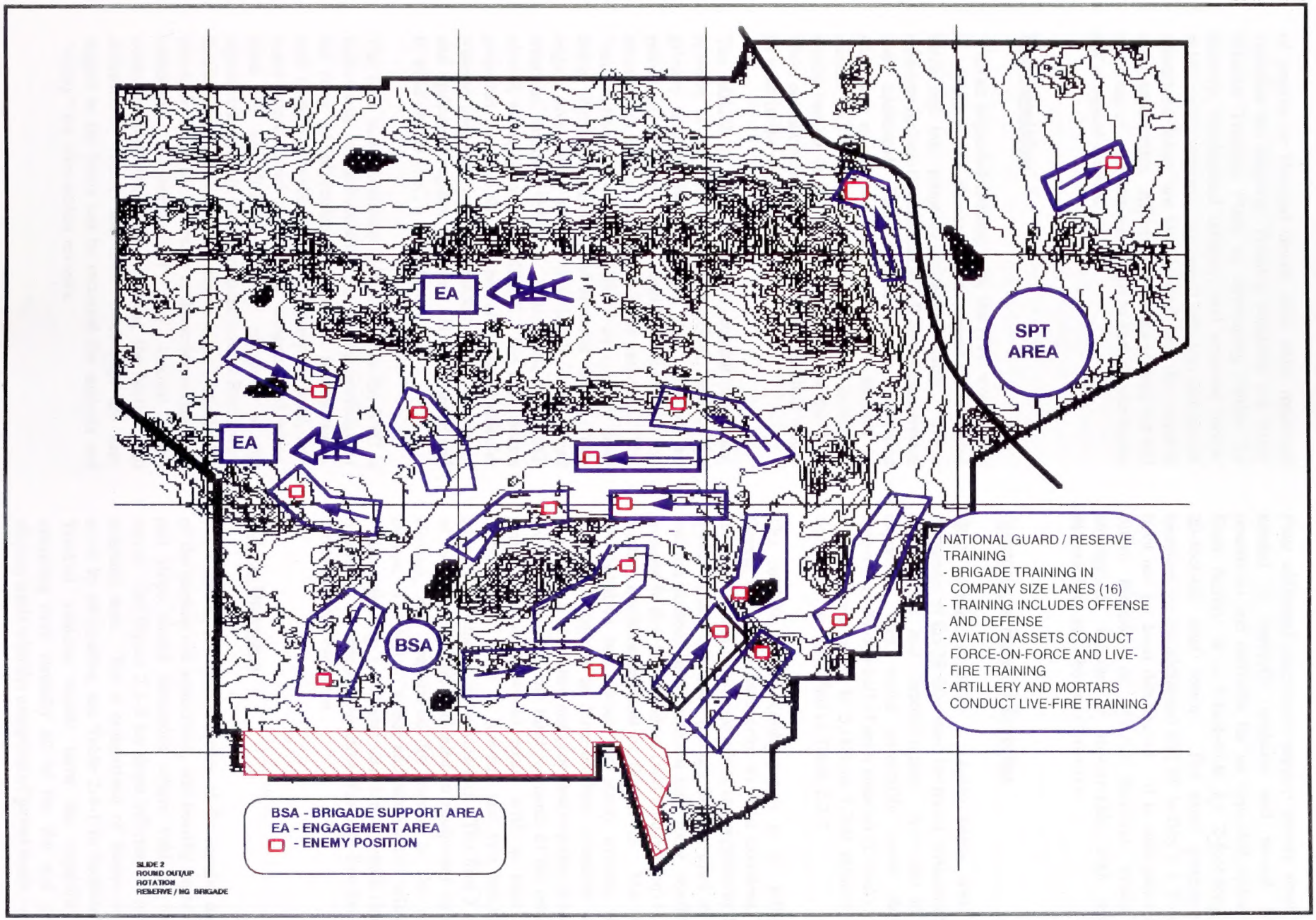


EXISTING MILITARY TRAINING SCENARIO

Figure 2.3-3



POTENTIAL SCENARIOS IN THE EXPANDED NTC
Figure 2.3-4



POTENTIAL SCENARIOS IN THE EXPANDED NTC
Figure 2.3-5

of reserve or National Guard units while rotational exercises are ongoing. Training scenarios use Army Mission Training Plans in developing battles for infantry, mechanized infantry, and armored forces. Additionally, airborne, air assault infantry, and special operations forces are incorporated into the scenario when appropriate. All battle scenarios portray the full spectrum of a modern battle fire to include electronic and chemical warfare.

Instrumentation

With an expanded training area, the NTC would have to expand certain elements of its current instrumented battlefield into proposed expansion lands. These elements include the MILES/ACMI laser-beam system and additional field instrumentation, including additional microwave towers. A third element of current NTC instrumentation, live-fire exercises, would remain in the northern segment of the Fort Irwin current boundaries. No live ammunition would be used in the expansion lands.

The MILES is used in enacted combat situations, referred to as force-on-force exercises, and is the primary casualty assessment tool used. For all the reality of fire power, hits, and casualties, no live ammunition is used in force-on-force exercises. The "ammunition" used by MILES is an eye-safe laser beam. Riflemen, gunners, and armored vehicle crews engage live enemy targets: individuals, crew-served weapons, armored vehicles, helicopters, and USAF aircraft all equipped with MILES. The laser beams projected simulate the fire power of the particular weapon used, and laser hit detectors on all personnel and equipment register whether a "hit" was made and to what degree (i.e., a casualty).

The field instrumentation system used at the NTC is linked with MILES/ACMI. The system provides for the relay of information (microwave transmission), such as types of vehicles, types of weapons fired, how many rounds fired from which weapons and when, from the battlefield to a base computer at the operations center in the cantonment area at Fort Irwin. In addition, mobile units are staged in the battlefield to record live television pictures as the action occurs with additional monitoring of live tactical radio communication taking place during the battle. All microwave, video, and radio recordings are time tagged so the battle can be recorded for analysis and "replay" for after-action reviews.

Four additional microwave support towers would be needed to correctly evaluate and record NTC operations and activities for an expanded operation. Each facility is a 4-foot-wide by 2-foot-long by 20-foot-tall small tower. The exact geographical locations for the additional MILES facility's A Towers have not yet been determined. It is anticipated that future locations of MILES facilities would be strategically located at topographic high points surrounding any chosen alternative.

Summary of Rotation Exercises

Each rotation involves a 14-day battle with the remainder of the 28 days used for travel, maintenance, mobilization, and demobilization. Activities in the expansion area could potentially occur during approximately one-half of each rotation (2 weeks) and would consist of up to 3,000 to 5,000 soldiers and equipment, as identified in Table 2.3-1.

The rotation period configuration is as follows. During the first 5 days prior to field exercises, the rotational unit is issued equipment and supplies by Fort Irwin. After this issue (occurs in first third of the rotation period), one battalion task force would be engaged in live-fire exercises (real ammunition) in the existing northern segment of Fort Irwin. The other two battalion task forces and Army aviation units would be engaged in force-on-force exercises on a combination of existing and proposed acquisition lands. During the second and third segments of the rotation period, the units would rotate with at least one battalion task force in live-fire and two battalions engaged in force-on-force exercises. The final 5 days of every rotation are dedicated to equipment turn-in, cleanup, and preparation for return to the home station. The mix of armor and mechanized infantry, which makes up a battalion task force, would change depending on training objectives for both live-fire and force-on-force exercises.

Vehicle Operation

For vehicles, the characteristics of the terrain, nature of the surface and subsurface, soil bearing capacities, and slope would determine where vehicles would travel. See Figure 2.3-2 for slope information for the planning area. For a comparison of maneuverable acres by alternative, see Table 2.4-1 in Section 2.4. Tracked vehicles would have the capability of operating over virtually all of the flat and gently sloping lands with the exception of paved roads, where

designated crossings would be used; dry lakebeds; or areas that may be designated as off limits (e.g., cultural sites, natural resources, rights-of-way). In some locations where topography or grade is a confining element, some engineering work may be performed to provide a one- or two-lane supply route through hilly terrain or a pass for tracked vehicles. For the purpose of this DEIS, under normal field training conditions, tracked vehicles may traverse slopes of less than 20 percent.
Wheeled vehicles would normally use established roads and trails. They would not operate for long distances over untracked desert surfaces. As noted, some supply routes may require initial engineering work but no further work during rotations. Major trails would be maintained by NTC maintenance crews, and all drainage structures would be maintained to eliminate or avoid man-caused erosion.

U.S. Army helicopters normally conduct nap-of-the-earth (extremely low level) flights below 200 feet above ground. This would include hovering at various altitudes (less that 200 feet above ground) for limited periods of times in daylight and nighttime operations. The USAF aircraft would fly from 500 feet above ground level to over 20,000 feet, depending on the nature of the exercise.

Hazardous Materials

Hazardous materials used in the proposed expansion area would include fuels (JP-8 and Mogas), antifreeze, motor oil, and vehicle batteries. All spills would be excavated, and the contaminated soil would be treated per federal, state, and local environmental regulations. If a spill of hazardous materials occurs, the responsible unit will report the spill in accordance with the installation spill contingency plan. Subsequently, the NTC will follow the spill contingency plan for appropriate action.

Other Surface Disturbances

In support of combat scenarios, trenches for "hull down" protection for armored vehicles, antitank ditches, and slit trenches may be excavated in nonsensitive areas. Toward the end of each rotation, these excavations would be filled and the ground surface restored.

Portable toilets would be placed in support and staging areas (explained later in this discussion) and other locations throughout the battle zone. These units are supplied and maintained by a private contractor. The sewage is disposed of at the main onpost sewage treatment plant.

Solid wastes resulting from consumption of field rations and any other trash that may accumulate during the action would be returned to the cantonment area for proper disposal in designated and approved disposal facilities with appropriate recycling for some elements. Toward the end of each rotation, all maneuver areas would be cleaned up with the collected trash returned to the cantonment area for proper disposal.

Support and Staging Areas

Support and staging areas are required as part of the training exercise. These areas contain ammunition, supplies, gasoline, diesel fuel, maintenance, mess, and other logistical support, medical evacuation units, special engineer units, and other "on call" support. These areas will consist of Tactical Assembly Areas (TAAs) or Logistic Support Areas (LSAs). Five TAAs will be established during each rotation for 2 days each. They will each involve an area of approximately 1.2 by 1.2 miles. Two LSAs will be established during each rotation for 7 days each. They will each involve an area of approximately 1.9 by 1.9 miles.

Normally, Army aviation units will stage out of these support and staging areas. Movement of traffic in the support and staging areas is orderly and can be controlled carefully. Combat (or forward) and field (or rear) resupply points are based in the support and staging areas. The combat resupply point would move out in support of the combat force when the action begins. The combat resupply element consists of fuel, ammunition, vehicle recovery equipment, ammunition resupply vehicles, communications vehicles, and medical facilities. The field resupply point has backup units for fuel, ammunition, medical field station, vehicle recovery and repair, and house-selected battalion headquarters elements and other headquarters company activities. Many of these soldiers and vehicles would remain in the support area throughout the "battle." The soldiers in all support and staging areas would be subjected to OPFOR rear-area operations, which include limited force-on-force raids,

vehicle ambushes, simulated chemical strikes, air attacks, and EW. The only tracked vehicles in the support areas are the equipment recovery units and disabled vehicles brought there for repair. The distances for restocking the field and combat resupply points must reflect some semblances of those that would be experienced under combat conditions and stress those supplying and those in need of supply to an appropriate degree. Timely and effective supply may determine the outcome of a battle.

Live-Fire Exercises

In addition to the MILES and the field instrumentation system, joint and combined arms live-fire exercises are part of the NTC training operations. Live-fire exercises normally take place in the northern area of existing Fort Irwin. (Live-fire exercises are not proposed on acquisition lands.) The area north of the Granite Mountains is fully used. In certain exercises, the area between Granite and Tiefort Mountains is used for live-fire exercises. Live-fire exercises provide brigade task force-sized offensive and defensive live-fire exercises using live ammunition. Task forces engage computer-controlled targets. Computer systems, in addition to remote controlled and man-portable television cameras, monitor and record the live-fire exercises. Live-fire exercises at the NTC are unique in that it is the only location, worldwide, available to the Army to use direct fire of combat vehicles in full battalion combat formation, overhead artillery fire, antitank missiles, antiaircraft missiles, air-to-air missiles, EW, attack helicopters, and USAF close air support weapons together at the brigade and battalion task-force level under realistic battlefield conditions.

In addition to close air support of NTC training, the USAF uses Leach Lake in the northern section of the existing Fort for a daily air-to-air and air-to-ground gunnery range. These exercises draw air crews from across the nation in rotations similar to the NTC program. The training is quite separate from NTC operations and has been in effect since 1967 and would continue into the future with or without expanded rotations.

2.3.2.3 Use by National Guard and Reserve Units

Various National Guard and Reserve units participate in NTC rotations in the same manner as regular Army units. In addition, National Guard and Reserve forces use the NTC for monthly training (2 to 4 days) and annual training (14 to 21 days) periods. These forces train during the periods between rotations, fully using the training areas, fixed gunnery ranges, and live-fire areas. Normally, the NTC does not provide OC or instrumentation support during these monthly or annual training periods. National Guard and Reserve components are supported with repositioned equipment from the NTC and Mobile and Training Equipment Sites (MATES).

The NTC's wartime mobilization mission includes preparing designated National Guard and Reserve forces for deployment to a war zone by conducting force-on-force and live-fire training. The proposed acquisition land allows the NTC to increase unit training by using the acquired land for logistics staging areas and freeing up additional maneuverable space in NTC's present area. Limited force-on-force operations would occur, such as raids, simulated chemical strikes, air strikes, and vehicle ambushes to fully train support personnel.

2.3.3 Land Acquisition Process

2.3.3.1 Withdrawal of Public Lands

Public lands are, by definition, generally open to public entry under the public land and mining laws, such as the 1872 Mining Law. This means that persons may use public lands for all uses allowed by law and land use planning. In the CDCA, public lands provide for a multitude of uses. Withdrawal of proposed lands for military purposes essentially removes the affected area from entry under Public Land Laws, except as provided through legislation to be developed subject to further negotiation between the Secretaries of Defense and Interior. The CDCA Plan would require an amendment if these lands were withdrawn from public entry. A military withdrawal of over 5,000 acres requires approval by Congress in accordance with the Engle Act (1958). See Table 2.3-2 for acreage of public and private lands.

2.3.3.2 Acquisition of Nonfederal Lands

The policy of the U.S. Army is to acquire only the minimum area or interest in the land necessary to accomplish the purpose of the authorized mission project. Lands that will generally be purchased outright by the U.S. Army include areas needed for

Table 2.3-2

SUMMARY OF LAND OWNERSHIP FOR EXPANSION ALTERNATIVES (acres)

Alternative	Public	Private	State, Local	Total
Proposed Action	310,296	5,148	15,773	331,217
Modified Avawatz-Silurian	253,300	4,380	12,350	270,030
Modified Coyote Basin	196,914	57,811	4,745	259,470
Alvord	168,700	37,300	4,800	210,800
Superior Valley	202,254	79,300	3,331	284,885
Avawatz	137,600	45,900	2,000	185,500

permanent structures, construction areas, air bases, and military posts or reservations. See Table 2.3-2 for acreage of public and private lands.

Private property is acquired at the "fair market value" of the property, which is often defined as that amount, in terms of cash, that would be agreed upon between a willing seller, not obligated to sell, and a willing buyer, not obligated to buy, both knowing all the conditions affecting such a sale. The definition is applicable even though property owners may be unwilling sellers for reasons that can be understood and appreciated. Acquisition of private property must be accomplished in accordance with Title III of Public Law (PL) 91-646, The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Title II of PL 91-646 requires that all persons displaced by governmental land acquisition actions be fully advised as to the relocation benefits available to them so that there will be as little adverse impact upon them as possible. In general, the law seeks to ensure that persons displaced by federal land acquisition will be able to acquire housing at least equal to that which they were required to vacate. Displaced persons are also entitled to moving expenses to compensate for moving their household goods. Relocation benefits are entirely separate from, and in addition to, the price paid for the property acquired. All displaced persons will be provided detailed information on the benefits available to them before their properties are acquired by the U.S. Army.

2.3.4 Construction

Limited construction activities are planned in the proposed land acquisition. It is anticipated that up to six underpasses will be constructed across State Highway 127 to allow tanks and other vehicles to cross under the highway.

No permanent construction is anticipated for any support or staging areas on the land proposed for acquisition. Water will be trucked to these areas and no wells will be drilled. Sanitation will be accomplished through the use of portable toilet facilities. There is a potential that concrete pads or similar facilities could be constructed in the future for equipment placement. These locations will be determined and analyzed in subsequent environmental documents.

Additional communication and control equipment will be required in the new acquisition areas, including the MILES and fiber optics.

2.4 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

This section identifies potential alternatives to the Proposed Action that were considered cost and operationally feasible for acquisition of additional lands to meet the NTC's training demand. Each alternative is described below, and the impacts of the alternatives are discusses in Section 4 of this document. Table 2.4-1 summarizes the features of each alternative.

2.4.1 Modified Avawatz-Silurian Alternative

The Modified Avawatz-Silurian Alternative (Figure 2.4-1) is similar to the Proposed Action in that this alternative lies primarily to the east and north of Fort Irwin. The major difference is that this alternative does not include the major utility corridor (Corridor D) that runs from southwest to northeast along Fort Irwin's southeastern boundary and bisects the Proposed Action. In this alternative, a 100-foot-

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Table 2.4-1

SUMMARY MATRIX OF ALTERNATIVES CONSIDERED

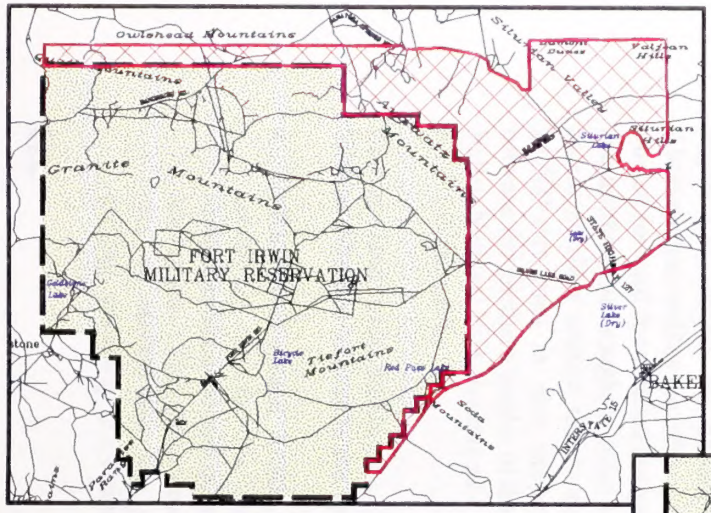
Alternative	Overall Size (acres)	Sufficient Maneuver Area	Presence of Challenging Topography	Adequate Time/Distance Factor	Adequate Maneuver Corridors	Year-Round Availability	Compatibility with Existing Military Use	Availability of Existing Infrastructure	Presence of Uncluttered Electromagnetic Spectrum	Proximal to Air Support Facility	Proximal to Carrier Groups	Reasonable Cost	Environmental Impact Issues
Proposed Action (Silurian Valley)	331,217	yes	yes	yes	yes (277,244)	yes	yes	yes	no	yes	yes	yes	yes
Silurian Valley/Mojave B	489,935	yes	yes	yes	yes (222,000)	yes	no	yes	no	yes	yes	yes	yes
Modified Avawatz-Silurian	270,030	yes	yes	yes	yes (226,793)	yes	yes	yes	no	yes	yes	yes	yes
Modified Coyote Basin	259,470	yes	yes	yes	yes (236,175)	yes	yes	yes	no	yes	yes	no	yes
Coyote Basin	281,300	no	yes	yes	yes	yes	yes	yes	no	yes	yes	no	yes
Alvord	210,800	no	yes	no	yes (190,727)	yes	yes	yes	no	yes	yes	no	yes
Superior Valley	284,885	yes	yes	no	yes (264,776)	yes	yes	yes	no	yes	yes	no	yes
WSA Exclusion	252,985	no	yes	no	yes	yes	yes	yes	no	yes	yes	no	yes
Avawatz	185,500	no	yes	no	yes (170,401)	yes	yes	yes	no	yes	yes	no	yes
Leach Lake Gunnery Range	92,626	no	no	no	no	maybe	no	yes	no	yes	yes	no	yes
Marine Corps Air Ground Combat Center, Twentynine Palms	596,000	yes	no	yes	no	no	no	no	no	yes	yes	no	yes
Fort Bliss, Texas	80,000	no	no	no	no	maybe	no	yes	no	no	no	no	yes
Dugway Proving Ground, Utah	738,000	yes	no	no	no	no	no	no	yes	yes	no	no	yes
Pueblo Army Depot, Colorado	250,000	no	no	no	no	no	no	no	no	yes	no	no	yes
Yuma Proving Ground, Arizona	584,000	yes	no	no	no	yes	no	no	yes	yes	no	no	yes
Fort Hood, Texas		no	no	no	no	maybe	no	yes	no	no	no	no	yes

Table 2.4-1

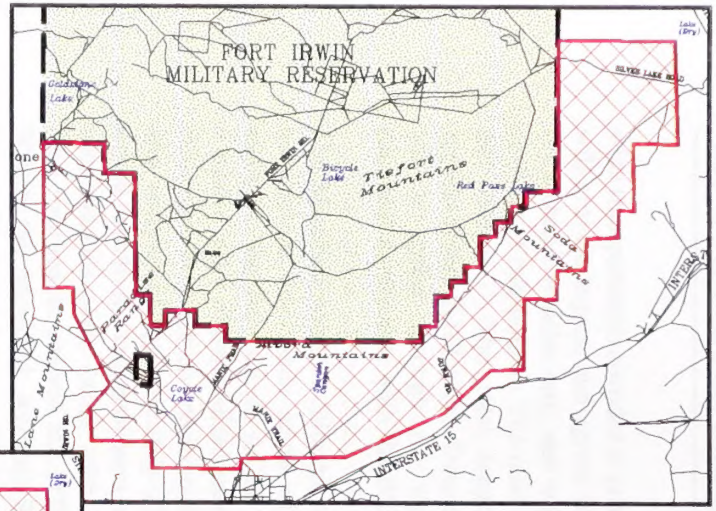
SUMMARY MATRIX OF ALTERNATIVES CONSIDERED

Alternative	Overall Size (acres)	Sufficient Maneuver Area	Presence of Challenging Topography	Adequate Time/Distance Factor	Adequate Maneuver Corridors	Year-Round Availability	Compatibility with Existing Military Use	Availability of Existing Infrastructure	Presence of Uncluttered Electromagnetic Spectrum	Proximal to Air Support Facility	Proximal to Carrier Groups	Reasonable Cost	Environmental Impact Issues
Fort Drum, New York	?	no	no	no	no	no	no	yes	no	no	no	no	yes
British Army Training Unit, Suffield, Alberta, Canada	?	yes	no	no	no	no	no	yes	no	no	no	no	yes
Canadian Forces Base, Shilo Wohnteil, Manitoba, Canada	?	no	no	no	no	no	no	yes	no	no	no	no	yes
Mojave B Range Only	160,225	no	yes	no	yes	yes	no	yes	maybe	yes	yes	yes	yes
Use of Areas North of NTC	?	no	no	no	no	maybe	no	yes	yes	yes	yes	no	yes

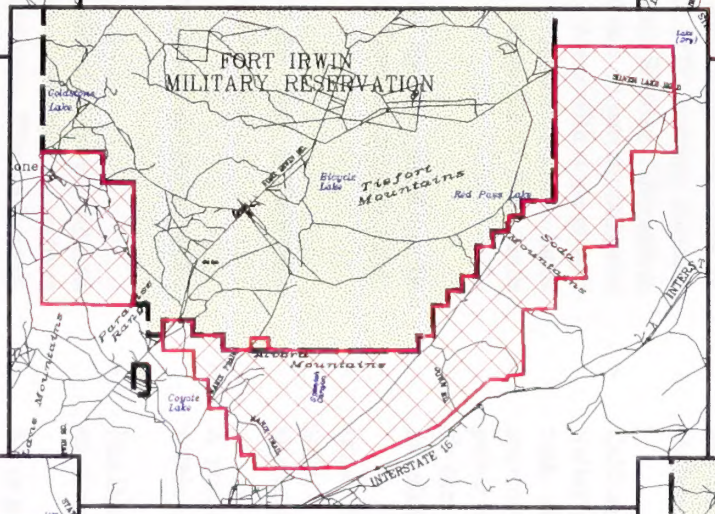
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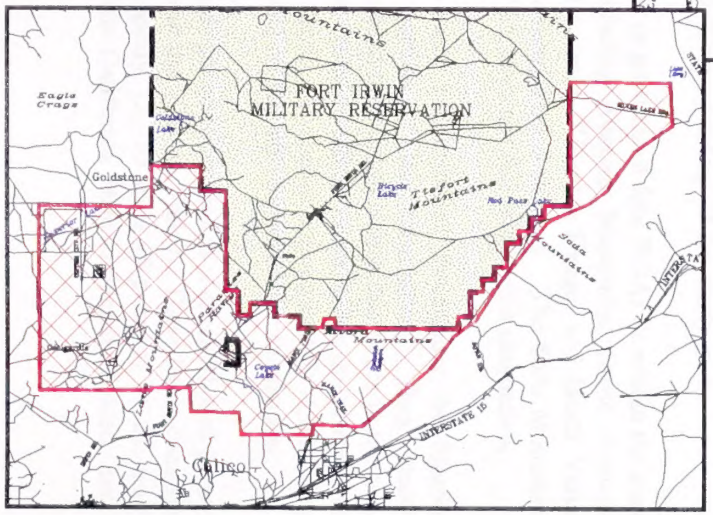
Modified Avawatz-Silurian Alternative



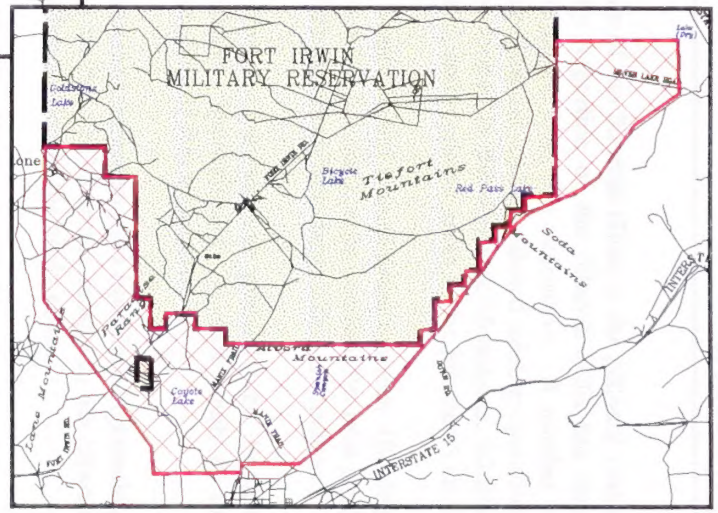
Modified Coyote Basin Alternative



Alvord Alternative



Superior Valley Alternative



Avawatz Alternative

ALTERNATIVES CONSIDERED IN DETAIL

Figure 2.4-1

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wide transportation corridor is proposed. This corridor will provide ingress and egress to the expansion area for wheeled vehicles only and will traverse the utility corridor at two points. The road will be a compacted dirt surface. The total length of this road is approximately 5-1/2 miles. Ownership of this corridor will be either through fee simple ownership or easement agreements with the BLM.

The Modified Avawatz-Silurian Alternative also does not include any lands south of the corridor. In addition, the Salt Creek ACEC and approximately 4 square miles of mineralized area around the Silurian Hills have been eliminated from this alternative. The area consists of approximately 270,030 acres, which would result in the provision of the 226,793 net maneuverable acres (acres with 20-percent slope or less) required to support the NTC training mission. Within the Modified Avawatz-Silurian Alternative, areas with slopes between 20 and 40 percent comprise approximately 31,513 acres. Areas with slope greater than 40 percent constitute nonmaneuverable lands (11,724 acres). Ownership categories of these lands are as follows:

- 253,300 acres managed by the BLM to be withdrawn from Public Domain through Engle Act legislation,
- 12,350 acres owned by the State of California proposed for purchase, and
- 4,380 acres of privately owned land proposed for purchase.

Figure 2.4-1 shows the Modified Avawatz-Silurian Alternative as well as the other acquisition alternatives carried forward for detailed analysis. The lands north and northeast are sought in order to provide a northern access corridor around the Avawatz Mountains. A 24,500-acre area is also proposed for acquisition between the northern border of the NTC and the Death Valley National Park to serve as a buffer area between NTC and the park.

Current land uses within the Modified Avawatz-Silurian Alternative include the following:

- Like the Proposed Action, only one mine is producing ore in this alternative, the Iron Mountain Mine located in the southern Avawatz Mountains. This mine produces iron ore at a rate of 50,000 tons per year. Exploratory drilling, underway in a claim group on the south side of the Silurian Hills, is the primary reason why a portion of the Silurian Hills has been eliminated from this alternative. A number of large inactive and abandoned mining operations are located in the Avawatz Mountains, Silurian Hills, and scattered areas in the Silurian Valley.
- A major utility transmission corridor (Boulder Corridor) is located approximately ½ mile south of the southern boundary of this alternative.
- A natural gas pipeline parallels the Boulder Corridor, approximately ½ mile south of the boundary of this alternative.
- Dispersed recreation (rock hounding, sightseeing, and limited OHV) occurs mostly in the Silurian Valley portion of the study area.
- California Highway 127 bisects the Silurian Valley portion of this alternative. Training on both sides of the highway is planned with approximately six specifically constructed cross points for tracked vehicles. Vehicle turnouts for civilian traffic to observe training are also part of the plan.
- Death Valley National Park lies adjacent to a portion of the northern boundary of this alternative.
- A portion of the Amargosa River drainage lies within the northern boundary of this alternative.
- The Denning Springs ACEC is located within the northern boundary of the study area.
- All or portions of four WSAs lie within the area, including Avawatz Mountains, South Avawatz Mountains, Kingston Range, and Death Valley National Park Boundary. The Soda Mountains WSA does not fall within this alternative.

Private lands are scattered throughout the Silurian Valley portion of the alternative. They mostly coincide with the mining claims that occur in the area. Very few actual dwellings occur within this alternative. Private lands encompass approximately 4,380 acres (2 percent) of the land proposed for acquisition.

State lands generally appear as a checkerboard pattern throughout the Silurian Valley. These lands comprise approximately 12,350 acres (5 percent) of the study area. The California State University System has a

research facility located at Sheep Creek Springs and managed by the Desert Studies Consortium.

2.4.2 Modified Coyote Basin Alternative

An alternative to the Proposed Action is the Modified Coyote Basin Alternative, shown on Figure 2.4-1. The alternative area lies southwest, south, and southeast of the existing NTC. This area totals approximately 259,470 acres, of which 196,914 acres are public lands currently administered by the BLM; 4,745 acres are state, county, City of Los Angeles, and Intermountain Power Agency (IPA) lands; and 57,811 acres are private lands. The Modified Coyote Basin Alternative provides the greatest amount of usable, connecting, unconstrained maneuverable space for military units involved in full brigade operations.

Table 2.4-2 provides a summary of the net maneuverable lands for the Modified Coyote Basin Alternative. Approximately 236,175 acres are considered net maneuverable lands, while 23,295 acres have slopes of greater than 20 percent. It provides the maneuver corridors for two task forces to operate simultaneously, using doctrinally correct widths and depths for a U.S. Brigade area of operations. This alternative allows U.S. Army scenario writers to produce more training variations for full brigade operations than any other action alternative. It allows units to take optimum advantage of increased weapons ranges, lethality, and doctrinal changes that are occurring now and will occur in the foreseeable future. This alternative provides sufficient length and width to allow armored vehicles to fully exercise their speed and mobility during full brigade training.

2.4.3 Alvord Alternative

The Alvord Alternative encompasses approximately 210,800 acres, of which 168,700 acres are public lands, 37,300 acres are private lands, and 4,800 acres are state, City of Los Angeles, and IPA lands. The area that would be acquired includes the south slope of the Avawatz Mountains, the west slope of the Soda Mountains, the maximum length of the Boulder Utility Corridor, Alvord Mountain, Spanish Canyon, the plain south of Alvord Mountain, and the area north of the Paradise Range to Goldstone. The Alvord Alternative is shown on Figure 2.4-1.

The areas north of the Paradise Range and south of the Avawatz Mountains would generally be used as staging and support areas for rotation soldiers and OPFOR. The remainder of this expansion area with mostly level slopes (less than 20 percent) would be used as training maneuver corridors. These corridors would be developed from a combined area of existing Fort Irwin and Alvord Alternative lands, which include corridors in proximity to Alvord Mountain, Soda Mountains, and the Boulder Utility Corridor. Direction of movement in these corridors could be a variation or complete reversal given particular training scenarios developed for a specific rotation brigade. Dismounted infantry may use the entire battlefield terrain, including the heights. As a minimum, high ground would be used for scouting and observation and would include areas such as Alvord Mountain, Soda Mountains, and southern Avawatz Mountains in the northern portion of the alternative area. There are approximately 190,727 acres of net maneuverable lands within this alternative (Table 2.4-2).

2.4.4 Superior Valley Alternative

The Superior Valley Alternative is approximately 284,885 acres, of which 202,254 acres are public lands, 79,300 acres are private lands, and 3,331 acres are state, county, and City of Los Angeles lands. The area to be acquired includes the south slope of the Avawatz Mountains, all public lands west of the existing occupied Boulder Utility Corridor, Alvord Mountain, Spanish Canyon, the plain south of Alvord Mountain west of the Boulder Corridor, the maximum length of Utility Corridor Q, the north slope of the Calico Mountains, all of the Coyote Lake Basin, Lane Mountain, the northern end of the Mud Hills, the Copper City area, the Paradise Range, Superior Valley, Superior Lakes 1 and 2, and the Goldstone area. The Superior Valley Alternative is shown on Figure 2.4-1.

The areas generally south of Superior Dry Lakes and south of the Avawatz Mountains would generally be used as staging and support areas for rotation soldiers and OPFOR. The remainder of the more level areas (less than 20-percent slopes) would be used as training maneuver corridors. These corridors would be developed from a combined area of existing Fort Irwin and the Superior Valley Alternative lands, which include corridors in proximity to Alvord Mountain, Lane Mountain, Paradise Range, Coyote Lake Basin (except the lakebed), and Superior Valley area (except

Table 2.4-2

NET MANEUVERABLE ACRES FOR EACH ALTERNATIVE

Alternative	Total Area	Area >40% Slope	Area >20% and <40% Slope	Net Maneuverable Area <20% Slope
Proposed Action	331,217	14,157	39,816	277,244
Modified Avawatz-Silurian	270,030	11,724	31,513	226,793
Modified Coyote Basin	259,470	4,009	19,286	236,175
Alvord	210,800	3,244	16,829	190,727
Superior Valley	284,885	2,792	17,317	264,776
Avawatz	185,500	2,244	12,855	170,401
Total Study Area*	625,632	16,841	56,334	552,457

* **Study area includes proposed acquisition area and other alternatives analyzed. Acreage overlaps among alternatives.**

the lakebed). Direction of movement in these corridors could be a variation or complete reversal based on particular training scenarios developed for a specific rotation brigade. Dismounted infantry may use the entire battlefield terrain, including the heights as a minimum; high ground would be used for scouting and observation and would include areas such as Alvord Mountain, Lane Mountain, Paradise Range, and southern Avawatz Mountains in the northern portion of the alternative area. Approximately 264,776 acres would be considered maneuverable within this alternative (Table 2.4-2).

2.4.5 Avawatz Alternative

The Avawatz Alternative is approximately 185,500 acres, of which 137,600 acres are public lands, 45,900 acres are private lands, and 2,000 acres are state and county lands. The lands that would be acquired include the south slope of the Avawatz Mountains, the public lands west of the centerline of the Boulder Utility Corridor, Alvord Mountain, Spanish Canyon, the plain south of Alvord Mountain, the Coyote Basin, the Paradise Range, and the Goldstone area. The Avawatz Alternative is shown on Figure 2.4-1.

The areas north of the Paradise Range and south of the Avawatz Mountains would generally be used as staging and support areas for rotation soldiers and OPFOR. The remainder of the more level areas (less than 20-percent slopes) would be used as training maneuver corridors. These corridors would be developed from a combined area of existing Fort Irwin and Avawatz Alternative lands that include corridors in proximity to Alvord Mountain, Paradise Range, and Coyote Lake Basin (except the lakebed). Direction of movement in these corridors could be a variation or complete reversal based on particular training scenarios developed for a specific rotation brigade. Dismounted infantry may use the entire battlefield terrain, including the heights. As a minimum, high ground would be used for scouting and observation and would include areas such as Alvord Mountain, Paradise Range, and southern Avawatz Mountains in the northern portion of the alternative area. Approximately 170,401 acres would be considered maneuverable within this alternative (Table 2.4-2).

2.4.6 No Action Alternative

The No Action Alternative would involve no expansion of the NTC boundaries. Examination of a No Action Alternative is required by the National Environmental Policy Act (NEPA). The areas proposed for acquisition would remain under the control of either the BLM, State of California, or private ownership.

The BLM would continue to manage public lands according to the CDCA Plan and other regulations.

Regardless of whether the Proposed Action is approved, the mission of the NTC will continue to require that units be trained in realistic combat scenarios. The lack of adequate space will result in less-than-realistic training scenarios, especially in relationship to time and distance factors and logistic support. Commanders would not have the opportunity to practice these aspects under realistic combat training; therefore, the combat readiness of the units may be undermined.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER ANALYSIS

Several additional alternatives were identified in the initial scoping of the EIS. These preliminary alternatives were evaluated regarding their feasibility from an operational, environmental, and cost standpoint. The following alternatives were not considered for further analysis for reasons described in subsequent pages. Table 2.4-1 summarizes the features of each alternative.

2.5.1 Silurian Valley/Mojave B Alternative

An alternative to the Proposed Action is termed the Silurian Valley/Mojave B Range Alternative and involves expansion of the NTC into the Silurian Valley/Valjean Hills and Soda Mountains as well as expansion into the central portion of the Mojave B Ranges. The characteristics of this alternative are discussed below.

This expansion alternative encompasses areas adjacent to Fort Irwin and extends primarily to the east and west. The area consists of approximately 489,935 acres, which would result in the provision of the 222,000 net maneuverable acres required to fully support the NTC training mission. Ownership categories of the lands under this alternative include the following:

- 306,298 acres managed by the BLM to be withdrawn from Public Domain through Engle Act legislation,
- 160,225 acres managed by the Navy as part of the Mojave B Range of the NAWS proposed for joint use with the Army,
- 15,374 acres owned by the State of California proposed for purchase, and
- 8,038 acres of privately owned land proposed for purchase.

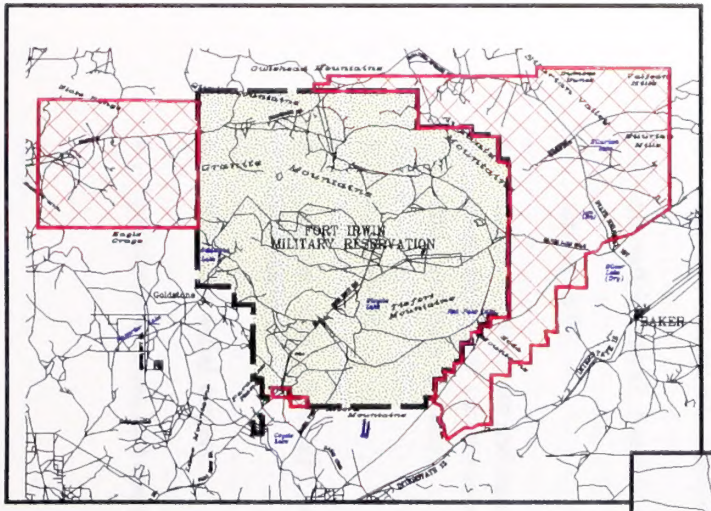
Figure 2.5-1 provides a map of Fort Irwin and the Silurian Valley/Mojave B Alternative.

Areas in this alternative that would be subject to joint use within NAWS are mostly mountainous, but the large central Pilot Knob Valley is suitable for training purposes. The Mojave B lands were previously withdrawn from the public domain by the U.S. Navy in 1950.

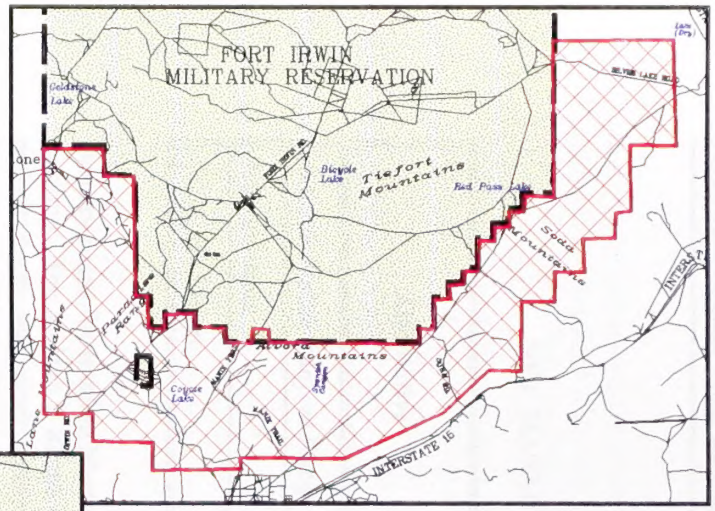
Under this alternative, full realistic battle scenarios can be laid out with realistic time/distance factors for both the rotational forces and OPFOR. In most instances, a major portion of the actual battles will occur within existing NTC boundaries. Support bases for both the rotational unit and OPFOR will be placed further back into the Silurian Valley and the Mojave B Ranges. This will provide a more realistic time/distance factor for commanders.

Table 2.5-1 provides a summary of the net maneuverable lands for the Silurian Valley/Mojave B alternative. The total net maneuverable land within the boundary of this alternative is 330,745 acres (516.79 square miles). Even though this total maneuverable area is larger than the required 222,000 net maneuverable acres required by the LURS, the area within the Mojave B Range of the NAWS would not all be used at any given time. Thus, the only portions of the alternative area that would actually be a new acquisition for the DOD are the Silurian Valley and the 4 square miles at the southern boundary. The remainder of the land, within the Mojave B Range, has already been withdrawn by Congress for the DOD.

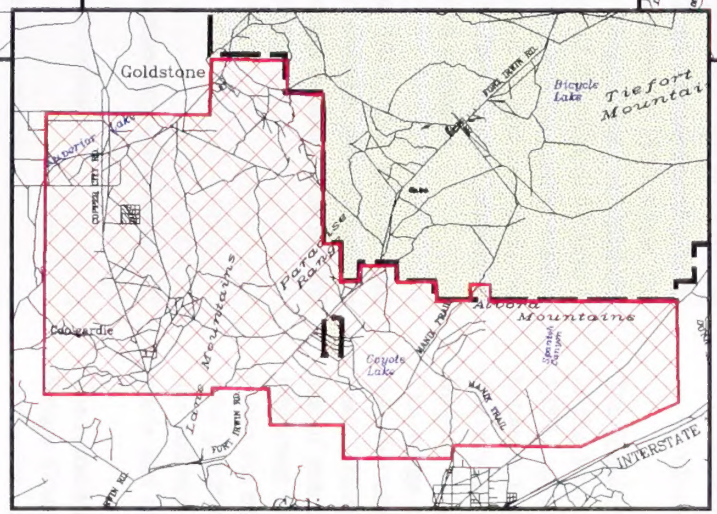
Land uses within the Silurian/Valjean Valley area are as described under the Proposed Action. The NAWS Mojave B Range, located in San Bernardino County, was originally a WWII facility of the former Marine Corps Auxiliary Station at Mojave, California. This range was initially reserved for exclusive military use as a free (unscored or self-scored) aerial bombing and



Silurian Valley/Mojave B Alternative



Coyote Basin Alternative



WSA Exclusion Alternative

ALTERNATIVES ELIMINATED FROM FURTHER ANALYSIS

Figure 2.5-1

/gis/plots/6347_fortirwin/plots/plot_many_alts.ami
Project #6347

Table 2.5-1

NET MANEUVERABLE ACRES FOR ELIMINATED ALTERNATIVES

Alternative	Total Area	Area >40% Slope	Area >20% and <40% Slope	Net Maneuverable Area <20% Slope
Silurian Valley/Mojave Range B	489,935	55,841	103,349	330,745
Coyote Basin	281,300	11,999	42,471	226,830
WSA Exclusion	252,985	2,294	17,898	232,793

gunnery range for training Marine Corps pilots during wartime. The Mojave B Range was separated into its present north and south sectors in 1950 when the Randsburg Wash Test Range was established, occupying the central portion of the original Mojave B Range and extending the NAWS perimeter several miles to the west. As a result of previous uses, the Randsburg Wash/Mojave B Test Range Complex is contaminated with unexploded ordnance.

Since its establishment in 1943, the mission and programs of NAWS have evolved and changed in response to the needs of national defense. The NAWS is responsible for the following:

- air warfare analysis;
- air combat systems engineering and integration;
- missiles and missile subsystems;
- aircraft-launched, free-fall weapons;
- aircraft EW;
- range development and operation (air-to-air, air-to-surface, and surface-to-air weapons; air EW and parachute systems);
- explosives;
- missile and free-fall weapon fusing and warheads;
- full-scale aerial targets;
- parachute systems and components; and
- aircraft and missile nonnuclear survivability and vulnerability.

The Randsburg Wash/Mojave B Test Range Complex is the base for Navy and USAF operations. Since 1980, under a host-tenant real estate agreement between the Navy and the USAF, an air weapons delivery range in the Superior Valley range area of Mojave B South has been constructed and maintained. The range is heavily used by many operational and reserve units of the USAF throughout each week of the year. Training requirements for these elements include use of practice ordnance and EW. The facility is an important facet of the USAF training programs and could not be replaced without significant interference with programs, schedules, and test operations. Land use and use of airspace are not compatible with NTC needs and requirements.

The remaining area of Randsburg Wash/Mojave B Test Range Complex is divided into three basic test and evaluation ranges: the Electronic Warfare Threat Environmental Simulation (EWTES), the Randsburg Wash fuse and gun target range, and North Mojave B tactical combat range.

In a mission compatibility study of the NTC's proposal for training on a portion of the Mojave B Range, NAWS confirmed previous findings by the NTC that this alternative would be incompatible with its respective missions (NAWS 1993). The reasons for this incompatibility are

- Pilot Knob Valley is not wide enough to satisfy armored maneuver training;

- existing range-wide unexploded ordnance contamination poses excessive safety hazards for armored maneuver training;
- high-performance aircraft engaging in low-level maneuvering cannot use airspace concurrently;
- safety/security considerations would preclude concurrent operations;
- Radio frequency spectrum use is controlled and saturated; additional use of the spectrum would prevent accommodation of other competing uses. Ongoing and planned NAWS expansions would increase capabilities and use;
- range remoteness supports highly classified sight-sensitive projects;
- Navy training requirements already compete for available time; and
- NTC operations could not be introduced without serious degradation of NAWS capability.

This alternative was eliminated from detailed consideration as a feasible alternative due to major objections from the NAWS. The NAWS' major concern was that NTC missions within the area were not compatible with its operation, and thereby seriously impacted its mission. Resolution of the proposed Army joint use of Navy land is within DOD and not subject to review in the DEIS.

2.5.2 Coyote Basin Alternative

The Coyote Basin Alternative is approximately 281,300 acres, of which 210,900 acres are public lands, 65,500 acres are private lands, and 4,900 acres are state, county, City of Los Angeles, and IPA lands. The area to be acquired includes the south slope of the Avawatz Mountains, the west slope of the Soda Mountains, the maximum length of the Boulder Corridor, Alvord Mountain, Spanish Canyon, the plain south of Alvord Mountain, Coyote Lake, the north slope of the Calico Mountains, the maximum length of Utility Corridor Q, the slopes and plain east of Lane Mountain, the Paradise Range, Paradise Springs, and the area north of the Paradise Range to Goldstone (Figure 2.5-1).

The areas north of the Paradise Range and south of the Avawatz Mountains would generally be used as staging and support areas for rotation soldiers and OPFOR. The greater Coyote Lake Basin, from the Paradise Range and Lane Mountain to the plain south of Alvord Mountain (with less than 20-percent slopes), would be used as training maneuver corridors. These corridors would be developed from a combined area of existing Fort Irwin and Coyote Basin Alternative lands, which include corridors in proximity to Alvord Mountain, Soda Mountains, eastern Lane Mountain, southern Paradise Range, Coyote Lake Basin (except the lakebed), and the Boulder Utility Corridor. Dismounted infantry may use the entire battlefield terrain, including the heights. As a minimum, high ground would be used for scouting and observation and would include areas such as Alvord Mountain, Soda Mountains, Lane Mountain, Paradise Range, and southern Avawatz Mountains in the northern portion of the alternative area. The net maneuverable land for this alternative is approximately 226,830 acres (Table 2.5-1).

This alternative was eliminated from detailed analysis because of its similarity with the Modified Coyote Alternative and its much greater impact on the threatened desert tortoise.

2.5.3 WSA Exclusion Alternative

The WSA Exclusion Alternative is approximately 252,985 acres, of which 165,262 acres are public lands, 86,123 acres are private lands, and 1,600 acres are state, county, City of Los Angeles, and IPA lands. Areas to be acquired include Alvord Mountain and Spanish Canyon, the plain south of Alvord Mountain, the Coyote Basin, Lane Mountain, the northern end of Mud Hills, the Paradise Range, Paradise Spring, Superior Valley, Superior Lakes 1 and 2, the Goldstone area, and the maximum length of Utility Corridor Q (Figure 2.5-1).

The areas south of Superior Dry Lakes and an area on existing Fort Irwin, located southwest of Avawatz Mountains, would generally be used as staging and support areas for rotation soldiers and OPFOR. The rest of the more level areas (less than 20-percent slopes) would be used as training maneuver corridors. These corridors would be developed from a combined area of existing Fort Irwin and WSA Exclusion Alternative lands that include corridors in proximity to Alvord Mountain, Lane Mountain, Paradise Range,

Superior Valley (except the dry lake), and Coyote Lake Basin (except the lakebed). Dismounted infantry may use the entire battlefield terrain, including the heights. As a minimum, high ground would be used for scouting and observation and would include areas such as Alvord Mountain, Lane Mountain, and Paradise Range. There are approximately 232,793 acres of net maneuverable lands within this alternative (Table 2.5-1).

This alternative was not considered further because of its similarity to other alternatives that are considered in detail, as well as changes in the WSAs due to proposed desert conservation legislation.

2.5.4 Leach Lake Gunnery Range

In considering ways of extending the maneuver areas of Fort Irwin, attention was initially given to rearrangement of existing uses in Fort Irwin to facilitate the opening of new corridors for force-on-force action. In years past, some of the older and less intensively used ordnance impact areas on post, such as Langford, had been cleared and, with some restrictions, incorporated into maneuver corridors.

Some consideration was given to deletion of the live-fire exercises and reallocation of that area. This was soon eliminated as a possibility because the NTC represents the only opportunity for armored and mechanized brigades in the continental United States to undertake offensive and defensive live-fire actions in brigade-sized combat formations. The elaborate system of instrumented targets portraying forward elements of an OPFOR, including antitank simulations, tests the actions of the brigade in training. Live-fire exercises performed in daylight and nighttime conditions produce the closest simulation possible of action on a modern battlefield. Therefore, it was determined that elimination of the live-fire exercise would be counterproductive and contrary to the stated mission of the NTC.

The next consideration was moving the live-fire range north to the Leach Lake Impact Area. Viewed solely from U.S. Army training interests, this would permit the use of the central corridor for two-battalion, force-on-force exercises for the entire rotation instead of the 4 to 6 days for each rotation in which the central corridor is now used. While there are advantages to the extra days of availability, the central corridor presents the following problems:

- inadequate length, causing unrealistic supply activities and staging distances,
- doctrinally incorrect locations of OPFOR staging areas (this can be improved to some extent by the joint use of 20,000 acres of NAWS lands, now in the planning process),
- limitation of intelligence-gathering potential,
- some restrictions on corridor width at certain locations, and
- adds very little to north-south maneuver capability.

Location of live-fire in Leach Lake would create difficulties, including the following:

- Very constrained maneuver corridor. Area is less than one-half the size of the present live-fire area, and topography is more difficult to negotiate.
- Expensive and difficult to surface clear the impact area of unexploded ordnance and virtually impossible to provide guarantee of effective clearance of subsurface unexploded ordnance. This would restrict excavation in the area and prove to be a hazard in relocating target pits. Leach Lake area consists of about 91,000 acres. Based on an approximate cost of $700.00 per acre for surface clearing (NTC current average cost for surface clearance) and up to $10,000 per acre for subsurface clearance to about 10 feet (given current technology), the total approximate cost of clearing the total area for maneuver training would be about $973,700,000.
- Possible restriction of range of some weapons in offensive actions.
- Limitation of area size could place some ordnance impact areas unacceptably close to the Fort boundaries, creating potential hazard for off-post properties.
- Great cost of moving targets and control and identification systems.

Viewed from USAF interests, the change would be of greater impact. Although Fort Irwin is noted as the NTC for U.S. Army task forces in partnership with USAF close air support, the Fort also provides some

unique USAF training missions. The corridors for low-level flights are on the southeastern and southern Fort boundaries, and corridors for supersonic flights were west of the Fort. Under a joint-use agreement signed on February 1, 1967, the Leach Lake impact area has been used by the USAF and planes of the U.S. Navy and U.S. Marines year-round for air-to-air and air-to-ground gunnery activities and as an east-west, low-level flight corridor. The complex is approximately 24 by 6 miles in size. The range is used by the USAF on an average of 18 days per month.

Participating in the aerial combat exercises are all USAF/Navy/Marine fighters, including A-4, A-6, A-7, A-10, F-4, F-14, F-15, F-16, F-18, F-111, FB-111, and B-1 and B-52 bombers. Normally, the range use is a two-aircraft flight, but in mass exercises 25 to 50 craft may strike in one mission.

Aerial ordnance impacting the Leach Lake range includes all USAF/Navy general-purpose bombs of 1,000 pounds or less, practice bombs, bullets of 40 millimeters (mm) and smaller, 2.75-inch rockets, Maverick missiles, and any other conventional ordnance. Chaff and flares are also dropped over the area. An unknown number of unexploded ordnance are in the area.

If the range were closed, it would require finding another site in the general location of Fort Irwin to provide for USAF training. This would cause new land use and environmental impacts and conceivably could impinge on recreation or wilderness areas or areas of existing or potential urbanization. A new location would require new approach air corridors in a region of concentrated and protected air corridors. The impacts of relocation could be severe.

In addition, closing the Leach Lake aerial gunnery range would place an unacceptable burden on the USAF, Navy, and Marines; interrupt a proven and successful training mission; and accrue no appreciable benefits to the NTC. The Leach Lake Alternative was rejected as being operationally incompatible and not in the interests of the nation's defense efforts. For these reasons, the alternative has not been analyzed in detail.

2.5.5 The Marine Corps Air Ground Combat Center, Twentynine Palms, California

The Marine Corps Air Ground Combat Center (MCAGCC) is located in San Bernardino County, about 30 miles southeast from the southern boundary of Fort Irwin. No direct road or trail connects the two installations (approximate travel distance by a multiple road network is 80 miles). It has been suggested that a tank trail be built from the Marine base to the Manix railhead north of I-15. If built, this could connect to the tank trail from Manix to Fort Irwin. This is a separate proposal not linked to expansion of the NTC. Department of the Navy filed right-of-way reservation application CACA 25503 with the BLM on August 2, 1990. This application is for a proposed tactical vehicle corridor linking the MGAGCC with the Army Manix tank trail access to the NTC.

The MCAGCC is 932 square miles (596,000 acres) in size. The terrain consists of steep-sloped mountains with relatively short, narrow intervening valleys for the most part. The mountains are oriented northwest-southeast. Relief is moderate, with elevations ranging from 1,800 to 4,500 feet, with most peaks rising 2,000 feet above their valleys. Several dune areas, lava flows, and dry lakes are filled for brief periods after heavy rains.

The mission of the MCAGCC is to develop, conduct, and evaluate the Marine Corps Combined Arms Training Program and provide training facilities for tenant activities. The MCAGCC is the only base in the world where Marines can simultaneously exercise their full range of combined arms capabilities. An average of 50,000 Marines are trained there every year.

The main base is located at the middle of the southern boundary adjacent to Mesquite Lake. This is the outlet for the longest and widest valley on the installation, extending northwesterly to Quackenbush Lake and Gays Pass. About 4 miles northwest of the main base is Camp Wilson, which is the support base for soldiers on combined arms training rotations and the Expeditionary Airfield where soldiers land and air sorties of the air combat element originate.

The MCAGCC was opened in 1940 as a U.S. Army glider training area, a function that continued until 1943, after which it was used for training of U.S. Army fighter pilots and later for Navy bombing

and gunnery ranges. The MCAGCC installation was closed from 1945 to 1952, while it was transferred to the custody of San Bernardino County.

In 1952, the base was reopened as a Marine Corps installation and Headquarters Marine Corps Training Center. It has developed into the MCAGCC, serving all Marine organizations in the continental United States with rotations of about 2,400 soldiers coming in for 21 days of combined arms exercises. About 16,000 marines, dependents, and civilian workers live/work on base, including 7th Marine Amphibious Brigade and components of its ground combat elements. Also located on base are the Marine Corps Communications-Electronic Schools, the largest formal school complex in the Corps.

The battalion-size marine rotations provide pre-exercise specialized training and exercising of each level of command throughout the battalion and its supporting organization, including artillery, helicopter, and close air support and bomber units. Training is cumulative, culminating in the entire air-ground team participating as a battalion task force in a 3-day battlefield exercise. During the 3 days, the battalion covers up to 37 miles of tough desert terrain. The force uses live fire while maneuvering, passing through the impact areas as they continue to advance.

The task force is opposed by a simulated Soviet-type motorized rifle battalion (reinforced). The simulation begins as a letter of instruction and continues in the form of intelligence summaries and input from the Tactical Exercise Evaluation and Control Group. An enemy presence is represented by targets on the ground. Studies are being conducted of the possibility of overlapping rotations so that the incoming battalion can provide real-time live opposition for the battalion completing the rotation. Exercises are based on the concept of attack, with the enemy defending, withdrawing, and counterattacking.

Corpsmen and equipment carry the MILES transmitters and receptors, but the battlefield is not instrumented so that after-action reports are based primarily on the observations of the Tactical Exercise Evaluation and Control Group.

The primary emphasis in the training exercises is on the ability of the commander and his staff to integrate and coordinate supporting arms in a realistic, mechanized live-fire battlefield environment.

An analysis of the terrain on the Marine Corps base at Twentynine Palms indicates that only one area is sufficiently wide for a two-battalion task force front. This is in the southwest corner between Bullion Mountains and the western boundary of the installation. The base of this area includes Camp Wilson and the Expeditionary Airfield, which precludes a substantial part of the lower sections of the valley from the exercises. Furthermore, the topography in this general area does not provide the variety of terrain needed to secure a brigade support area, attack position, or OPFOR staging area, all of which are required for NTC force-on-force exercises.

Less than 8 miles from a potential line of contact, the corridor is split by Hidalgo Mountain. The easterly corridor could handle one battalion task force front, with width considerations at Gypsum Ridge and Wood Canyon Trail. This corridor, leading to Quackenbush Lake and Gays Pass, affords a line of march of at most 18 miles, which is inadequate for most force-on-force exercises, which are generally 24 miles in length.

The westerly arm of the valley between Hidalgo Mountain and the western boundary closes in very rapidly, yielding a corridor 20 miles long but suitable only for a two-company front.

The only other corridor of any size on the installation runs from the Bullion training area in the southeast to the Black Top training area in the north. Although 24 miles long, the width is severely restricted on the southerly segment (about 6 miles). However, the major difficulty is that there is no suitable access for battalion-size task forces from within the base. Therefore, it cannot serve NTC two-battalion, force-on-force training.

There appears to be no area suitable for a separate battalion live-fire maneuver area, which is probably the reason the Corps uses the exercise corridors for live fire, traveling over the impact areas.

The base has only the most elementary systems of instrumentation. If it was suitable for NTC-type exercises, a major undertaking would be instrumentation of the battlefield, a mission that could only be undertaken at great expense. Another major difficulty would be cable connections back to the operations center in the cantonment area of Fort Irwin.

Viewed from every standpoint, the land at Twentynine Palms fails to provide for NTC needs; the distance

between the installations is a great impediment to coordinated brigade exercises, and instrumentation is a severe deficiency. Furthermore, the installation simply cannot handle the needs of the U.S. Marine Corps and the NTC. Commitment to NTC purposes would require relocation of present uses. While the topography and general terrain layout appear to be excellent for Marine training exercises, the base does not have the land areas and terrain needed to provide for U.S. Army-type, large-scale land attack and holding capabilities. For all these reasons, Twentynine Palms is not a viable alternative and has been eliminated from further consideration.

2.5.6 Other Nonadjacent or Out-of-State Military Lands

Other nonadjacent or out-of-state military lands were reviewed as part of the original NTC site selection process. These installations cannot provide the facilities required for the proposed expansion of the NTC.

The U.S. Army initially conducted a siting study to identify a location with sufficient acreage to accommodate operations envisioned for an NTC. The NTC Alternative Site Analysis (Headquarters of the United States Army Forces Command, Fort McPherson, Georgia) dated May 22, 1978, encompassed a review of all military installations in the continental United States. This showed that only seven of them had at least the required acreage of 400,000 as a combination of maneuver and range area. (Some installations may have greater acreage but are not trafficable or suitable for NTC training purposes.) The installations are listed below.

Installation	Acres
Fort Bliss, Texas	80,000
Dugway Proving Ground, Utah	738,000
Fort Irwin, California	462,000[a]
Pueblo Army Depot, Colorado	250,000[b]
Twentynine Palms, California	596,000
Yuma Proving Ground, Arizona	584,000

[a] **Fort Irwin is 642,731 acres, but lands have been dedicated to other purposes and are not available for maneuver and live-fire corridors.**

[b] **Three ranchers offered an additional 250,000 acres for purchase at Pueblo Army Depot to bring the total to 500,000 acres, plus further packages, if required.**

To these six, four other sites were added that did not have optimum acreage but appeared to have other advantages that justified further study of the sites. Two of the four were (1) Suffield, Alberta, Canada - 350,000 acres, and (2) Shilo, Manitoba, Canada - 103,000 acres. While under optimum acreage, these are used by British and German armies, respectively, as offshore training areas for armored and mechanized forces. The other two Army installations added to the study were Fort Hood, Texas, because two armored divisions were stationed there, and Fort Drum, New York, then the largest semiactive station in the continental United States and perceived to be relatively remote. (Fort Drum has since been designated as the home station for the 10th Mountain Division.)

The initial alternative site analysis was to determine whether any of the installations of appropriate size or with other advantages were feasible sites for NTC from an operational standpoint. The findings were as follows:

- **Fort Bliss, Texas** - Not feasible by virtue of lack of challenging terrain, difficulty in obtaining close air support, lack of good interoperability with USAF "Red Flag" program at Nellis AFB, cluttered electromagnetic spectrum, and doubtful availability of McGregor Range for live-fire maneuvers.

- **Dugway Proving Ground, Utah** - Not feasible due to lack of year-round trafficable maneuver area, lack of challenging terrain, and lack of good interoperability with USAF "Red Flag."

- **Fort Irwin, California** - The NTC site location FEIS was published on January 12, 1979, and a decision was made to locate the NTC at Fort Irwin.

- **Pueblo Army Depot, Colorado** - Not feasible due to severe restriction of usable maneuver area and airspace, inadequate area for live-fire maneuvers, lack of challenging terrain, and a cluttered electromagnetic spectrum.

- **Marine Corps Base, Twentynine Palms, California** - This facility was determined to be infeasible in the original siting study. Reevaluation of this facility for NTC expansion has been discussed previously in this section.

- **Yuma Proving Ground, Arizona** - Not feasible due to the inability of the post to accommodate both developmental testing and NTC operations simultaneously.

- **Fort Hood, Texas** - Not feasible due to lack of sufficient maneuver area, limited close air support, and a cluttered electromagnetic spectrum.

- **Fort Drum, New York** - Not feasible due to lack of adequate maneuver area, difficulty of close air support, and lack of full power jamming capability.

- **British Army Training Unit, Suffield, Alberta, Canada** - Not feasible due to training being limited to 6 months because of severe weather, lack of interoperability with present mission, and difficulty of close air support.

- **Canadian Forces Base, Shilo Wohnteil, Manitoba, Canada** - Not feasible due to restrictive size of maneuver/range areas, difficulty of close air support, unacceptably short training year, and lack of interoperability with present mission.

2.5.7 Closure of NTC

Comments were received from concerned citizens during the public scoping period (August 23 through September 26, 1988), which focused on inclusion in the EIS of an alternative that addressed closure of the NTC. This alternative has been determined not to be a viable alternative and was eliminated from further detailed analysis. This determination was based on the importance of the NTC mission in providing U.S. Army ground combat readiness for the nation. The NTC operates what may be the most highly sophisticated and technologically advanced training facility of its kind in the world. In terms of combined arms and single-mission training and research, the NTC is probably one of, if not the most, intensively used training areas in the entire defense training program. The NTC provides invaluable services for the Armed Forces and is an essential element of national security. The BRAC report of December 1988 recognized the importance of the training mission at the NTC and specifically recommended its expansion. The report noted that

> The increasing sophistication and extended ranges of modern weapons continually increase the requirements for training areas. . . . Furthermore, the increasing emphasis on joint and combined-arms operations expands the requirement for large training areas, such as the National Training Center at Fort Irwin, California.

The report also mentioned that large joint-training areas will help optimize the military use of restricted land, air, and water space, and allow the services to train as they would expect to fight. In order to do this, the services should be seeking ways in which they might expand training areas, such as the NTC at Fort Irwin, California, to accommodate the need for battalion, brigade, and division-level maneuver with artillery, missile, and air support, and to recognize the diminishing ability to accomplish such training in now-inadequate areas (Defense Secretary's Commission on Base Realignment and Closure 1988).

2.5.8 Use of Mojave B Range Only

This alternative would involve the use of the Mojave B Range as proposed but would not involve expansion of the NTC to the east. Use of this alternative alone was not considered feasible by the NTC because the extra acreage gained by the NTC would not be sufficient to meet its training needs because it is well below the 222,000-acre requirement. Furthermore, the configuration of this alternative would not allow for use of this area for effective training.

2.5.9 Use of Area North of NTC

The use of the area north of the NTC within the Owlshead Mountains and Death Valley National Park was not considered feasible due to both the land use constraints and the substantial environmental impacts associated with this alternative. Landforms due north of the NTC combined with the Leach Lake Gunnery Range effectively prohibit any meaningful maneuver of military forces.

2.5.10 Use of Increased Simulation

This alternative would use increased simulation training of soldiers rather than increased use of the

ranges for training. This alternative is not considered feasible because simulator training is already a major portion of the training for tank drivers and gunners. This cannot replace field training necessary for unit training. Simulation is already used to conduct force-on-force training for direct and indirect fire weapons, all aerial-delivered munitions, and combat engineer obstacles such as minefields. Casualty medivacs are simulated as part of the training. Increases in simulation technology will further improve the many ways simulation can be incorporated into military training. By itself, however, simulation is not an alternative.

2.5.11 Use of Modified Coyote Basin Alternative East and North of Soda Mountains and Relocate Cantonment Area to Nontortoise Habitat

This alternative was considered infeasible because it would be prohibitively expensive and still would not provide sufficient training areas.

SECTION 3 - AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the existing conditions of the study area and adjacent areas associated with the proposed acquisition of additional lands for the NTC. The area described in this section as the study area includes the proposed acquisition areas in the Silurian Valley and the areas that encompass other acquisition alternatives. The total study area encompasses 625,920 acres (acreage of alternatives overlap). The discussion of the affected environment also includes as necessary the existing NTC area (which is not part of the study area) so that impacts associated with acquisition of additional training areas can be placed in perspective.

3.2 GEOLOGY

3.2.1 Physiography

The study area is located in the Mojave Desert physiographic province. In this area, high mountain peaks and ridges are separated by broad alluvial fans and wide, flat valleys. Large basins without external drainage develop playas (very flat, dry lakebeds). The average elevation of the Mojave Desert is approximately 2,500 feet above mean sea level (MSL). Individual peaks of isolated mountain areas reach elevations of up to 7,929 feet MSL (Figure 3.2-1).

The southern portion of the study area falls within Coyote Basin. The dominant physiographic feature of this area is Coyote Dry Lake. The southeastern portion of the study area lies in the Cronese Valley, which is almost completely divided into two parts by the northeast end of the Cronese Mountains. Both halves of the valley contain dry lakebeds (East and West Cronese Lakes) at nearly identical elevations of approximately 1,082 feet.

The majority of the northeastern study area lies in the Silurian Valley, which is bordered by the Avawatz Mountains on the west and the Silurian Hills and Valjean Hills on the east. The Silurian Valley is floored by coalescent alluvial fans comprised of materials from the surrounding mountainous areas.

3.2.2 Historical Geology

Rock formations in the study area span a vast period of geologic time from the Precambrian (over 600 million years ago) to the Holocene (11,000 years ago to present). A thick sequence of sandstone, shale, and limestone was deposited during the Precambrian and subjected to regional metamorphism and igneous intrusion during the late Precambrian and early Paleozoic. The region received thick marine sediments, including massive limestone deposits, from inland seas that inundated the region from the Paleozoic through the Triassic period. Before the end of the Mesozoic era, the seas withdrew from the region, and large tectonic movements caused the sediments to be folded, faulted, and intruded.

In the early Tertiary period, the region was subjected to renewed deformation as the area was uplifted. This period was marked by extensive and deep erosion and creation of localized basins. A variety of sediment/rock types was produced, with some providing extensive fill in the ever-deepening basins. Events of the Quaternary period formed the topography seen today, and the Pleistocene experienced renewed movement along major faults, including upwarps of land masses with attendant folding and faulting.

3.2.3 Lithology

The regional geology of the study area is complex and varied. The occurrence and distribution of consolidated and unconsolidated rocks within the study area are briefly described below.

3.2.3.1 Consolidated Rocks

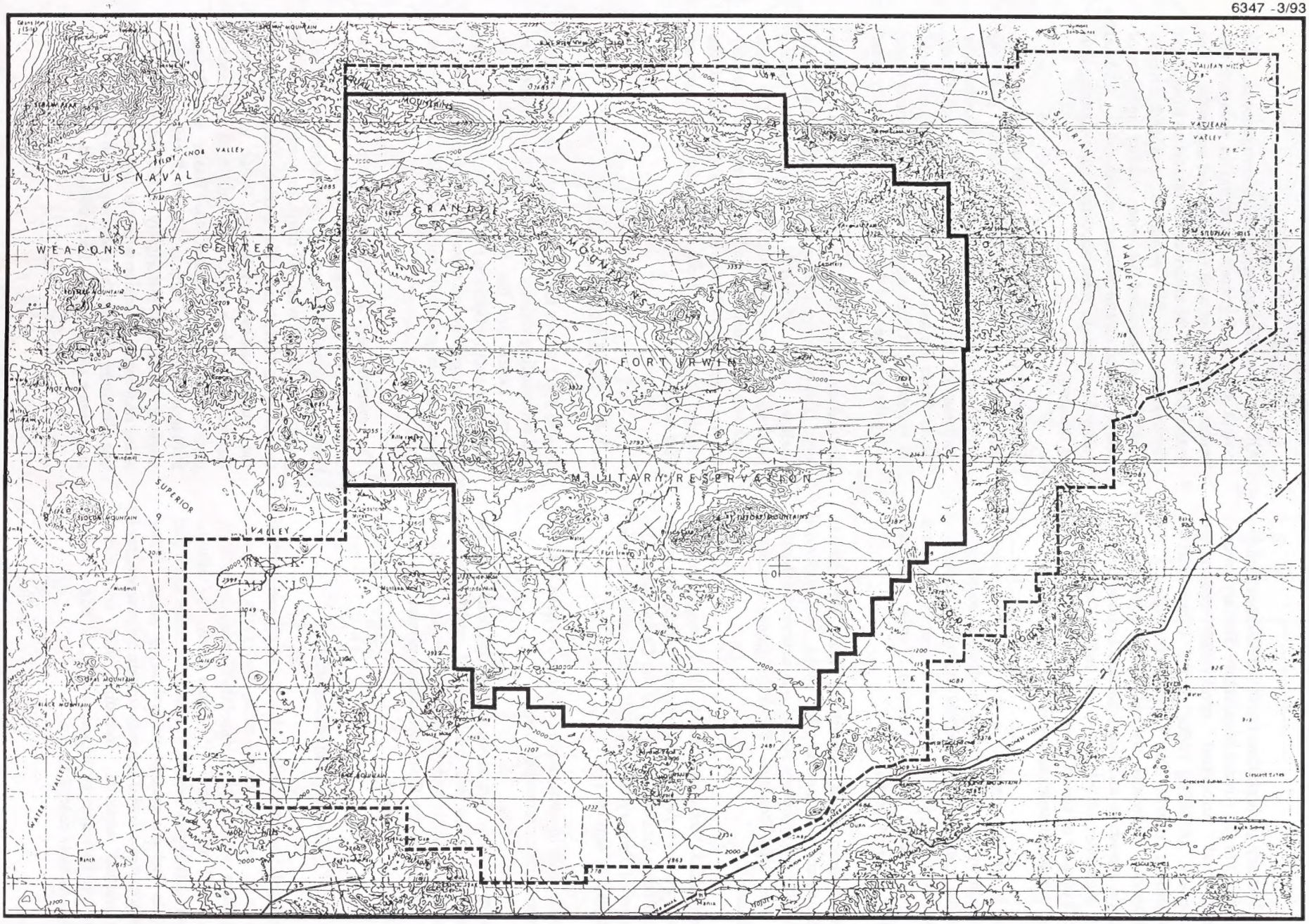
A complex assemblage of consolidated rock types in the study area forms the mountains and hills and underlies the alluviated valleys at depth.

The Salt Spring Hills are low, north-trending hills underlain by east-dipping Lower Cambrian strata of the Johnnie formation, Stirling quartzite, Wood Canyon formation, and Mesozoic granitic intrusive rocks.

The Silurian Hills are principally composed of Paleozoic carbonate rocks (of the Riggs formation) that have been thrust over later Precambrian sedimentary rocks. The older rocks are overlain by fan gravels and terrace deposits of several ages (Kupfer 1954). The western flank of the Silurian Hills is bordered by foothills comprised of southwest-dipping Paleozoic rocks. The low hills east of State Highway 127 and extending south of the Silurian Hills for approximately 12 miles consist largely of early Precambrian metasedimentary and intrusive rocks of the Haloran Complex (Wright and Troxel 1954).

The Avawatz Mountains are comprised of a complex assemblage of pre-Tertiary granitic and metamorphic rocks, Paleozoic sediments, Triassic metasedimentary and metavolcanic rocks, Tertiary sediments, and Tertiary volcanic rocks. The intersection of the Garlock and Death Valley fault zones along the northeastern flanks of the Avawatz Mountains is generally responsible for this stratigraphic complexity. Salt and gypsum deposits occur along this fault zone in the Avawatz Mountains.

A heterogeneous assemblage of igneous, metaigneous, and metasedimentary rocks spanning a long period of



SOURCE: USGS 1:250,000
Trona & Kingman, CA

TOPOGRAPHIC MAP OF THE STUDY AREA

Figure 3.2-1

pre-Tertiary geologic time forms the basement complex (bedrock) in the Alvord Mountains. Tertiary volcanic rocks and associated continental sedimentary sequences, including rocks of the Upper Barstow Formation, overlie the basement complex. The continental sediments are principally comprised of arkosic sandstone and conglomerate interbedded with thin sequences of silt, clay, and tuff. The volcanic rocks consist of basalt flows that are interbedded with the continental sedimentary rocks.

The basement complex in the Soda Mountains is overlain by up to 5,300 feet of alluvial conglomerate derived from basement detritus and minor amounts of sandstone, clay, and local lenses of monolithic breccia. In the southern Soda Mountains, Tertiary andesitic volcanics are exposed.

The Valjean Hills consist of later Precambrian sedimentary and metamorphic rocks, and undivided Paleozoic sedimentary rocks. An eastward extension of the hills contains Plio-Pleistocene nonmarine sediments.

The Calico Mountains derive their name from the many hues of yellow, red, green, and brown rocks comprising them. The rocks of the Calico Mountains consist of Tertiary lava and tuff, along with sandstone and clay of similar age.

The Cronese Mountains are comprised of pre-Cenozoic granitic and metamorphic rocks.

Within the study area along the Garlock fault zone, the Quail Mountains are made up of undifferentiated Mesozoic granitic and metamorphic rocks. North of the fault zone, the Quail Mountains primarily consist of Tertiary volcanics.

3.2.3.2 Unconsolidated Deposits

Unconsolidated deposits within the study area include alluvium, aeolian (dune) sand, and playa deposits. Alluvium consists of unconsolidated deposits of clay, silt, sand, and gravel. In some areas, the alluvial material is highly sorted, resulting in clean sands and gravels that are prolific water-bearing units. Other poorly sorted alluvial deposits contain large amounts of fine-grained material, including silts and clays. Alluvium increases in thickness from the edges of the basins to their central floors.

Alluvial deposits are generally heterogeneous, with coarse sands and gravels occurring in stringers and lenses, intercalated with finer grained sediments. The heterogeneity of the alluvium has important hydrologic implications and can result in localized artesian conditions as clays and silt lenses confine the layers of coarse-grained water-bearing sediments. Alluvial valley fill forms the most important water-bearing unit in the study area.

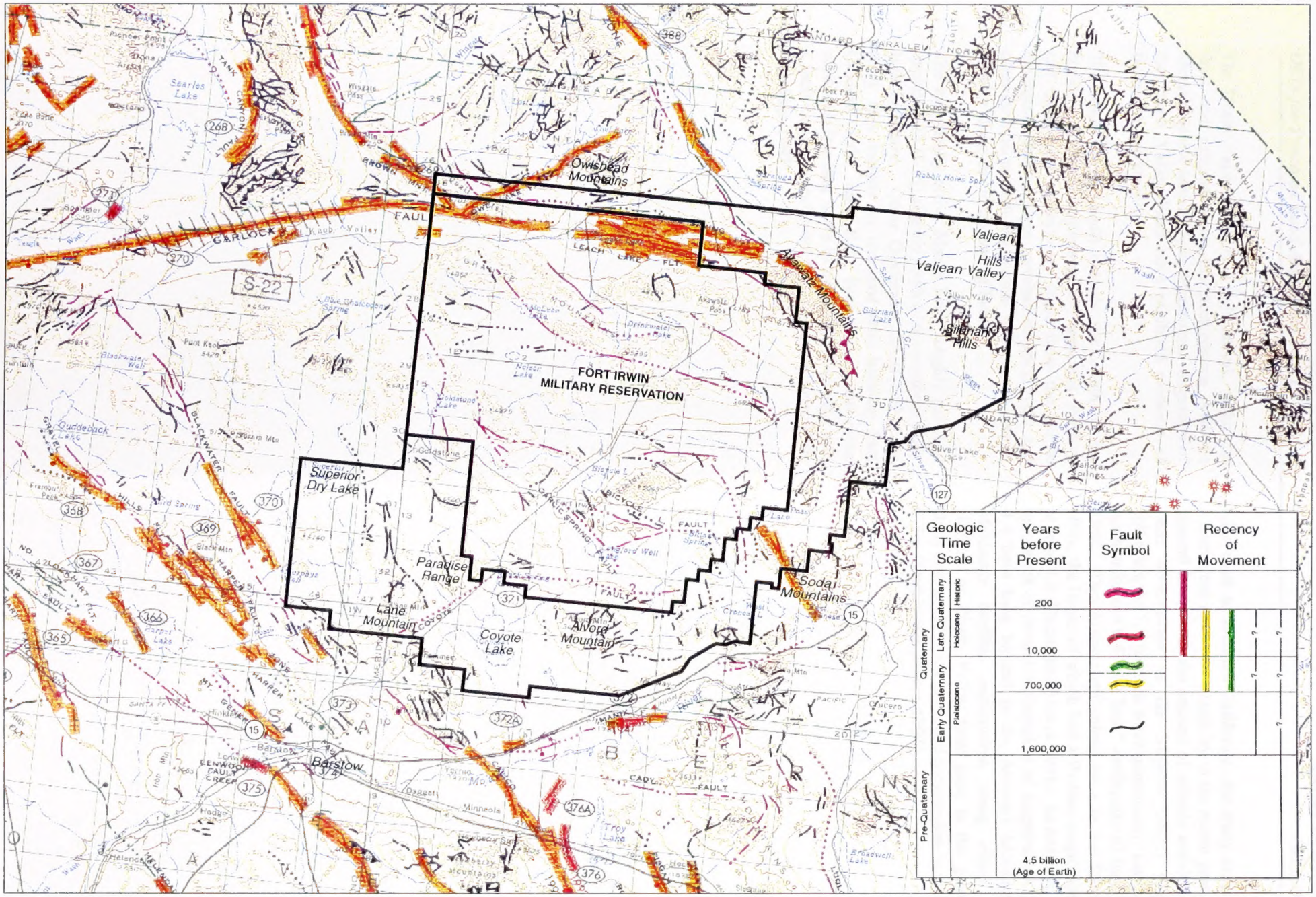
Significant deposits of aeolian (wind deposited) dune sand occur at Little Dumont Dunes near the northeastern study area boundary, large deposits occur northeast of the study area at the Dumont Dunes. These dunes are actively drifting but locally anchored by vegetation. Other wind-blown sand deposits occur along the periphery of dry lakes within the study area.

Several dry lakes (or playas) occur within the study area. The playa deposits accumulated from material in shallow bodies of water that covered the lower portions of closed valleys during floods. The exact thickness of the deposits underlying many of these dry lakes is unknown; however, playa deposits of the Mojave Desert range from a few feet to as much as 100 feet thick.

3.2.4 Faulting and Seismicity

Figure 3.2-2 shows the major faults in the study area and surrounding vicinity. Principal faults bounding the Mojave Desert are the San Andreas Fault to the southwest and the Garlock Fault to the northwest. The internal wedge between these faults defines the Mojave Desert and is generally referred to as the "Mojave block."

The eastern part of the study area is near the intersection of the Death Valley and Garlock fault zones. One major branch of the Garlock fault zone roughly coincides with the north to northeast face of the Avawatz Mountains. The Garlock Fault is one of the major east-west trending faults in southern California. It is a strike-slip fault with left-lateral displacement and separates the Basin and Range Province from the Mojave Desert Province. The Garlock Fault has historically exhibited seismicity along its western extension where it displaces Holocene age alluvium. Along the eastern portion of the fault, only minor seismicity has been observed.



N

Miles
0 12

Source: Fault Activity Map of California

FAULTS WITHIN THE PROJECT VICINITY
Figure 3.2-2

The Death Valley Fault is a right-lateral, strike-slip fault and extends along the northeastern Avawatz Mountains and eastern Soda Mountains. Segments of the Death Valley Fault have exhibited evidence of Holocene movement.

The Mule Spring Fault extends the length of the northern Avawatz Mountains and separates Tertiary and Quaternary sedimentary strata from the diorite basement. Shutter ridges, perched stream gravels, and other surficial tectonic expressions indicate very recent activity along the Mule Spring Fault.

The historically active Manix Fault roughly parallels Interstate 15 (I-15) slightly south of the southern study area boundary. Other Quaternary faults within the study area include an unnamed fault between East Cronese Lake and Red Pass Lake, numerous northwest-trending faults in the Soda Mountains, and a fault along the northwest flanks of the Silurian Hills (Jennings 1992).

Like most of southern California, the study area has experienced moderate seismicity in the recent past. A general increase in the amount of seismic activity has been documented in the Mojave Desert region following the 7.5 (surface wave magnitude) "Landers" earthquake and 6.5 "Big Bear" earthquake of June 28, 1992. Two historic epicenters were in the Silurian Hills, the larger of which had a Richter magnitude of at least 4.5 (Dames and Moore 1991). In addition, the epicenters of several earthquakes of magnitude 3.0 to 4.4 have been located in the Avawatz Mountains. Maximum credible earthquakes along either the Garlock or Death Valley fault zone in the general study area could result in ground acceleration in excess 0.3 g (Dames and Moore 1991).

3.3 SOILS

The study area is in the Mojave Desert portion of the Basin and Range Province, which is dominated by broad alluviated basins stretching between mountain ranges. Eroded mountaintops of outcropping bedrock rise above alluvial fans and valleys filled with sediment.

For much of the study area, detailed soil surveys have not been conducted by the U.S. Department of Agriculture Soil Conservation Service (SCS). Therefore, this analysis relied on generalized soil information from the SCS State Soils Geographic database (STATSGO) for the State of California (SCS 1993). STATSGO soil maps are made by summarizing more detailed soil maps. Where detailed soil maps are not available, soils information is derived from assembled geology, topography, vegetation, and climate data, and satellite imagery.

3.3.1 General Soil Characteristics

Soils develop very slowly in the extreme and harsh conditions of desert ecosystems and may not be replaced for centuries following disturbance (Phillips, Brant, Reddick 1981). Thus, desert soils are extremely fragile and vulnerable to disruption. Disturbed soil can become easily eroded by the action of wind and water. Particles of silt, clay, and sand can become airborne and may be blown onto adjacent hills or mountainsides, changing their appearance. Soil may also be transported away from disturbed areas, leaving them void of any soil or soil-forming materials. Desert soils are also highly vulnerable to compaction.

Desert pavement is found within the study area and throughout the greater Mojave Desert. Desert pavement may include many different soil associations; however, it is usually characterized by a surface crust of pebbles and rocks, often rendered dark and shiny, that protects the fragile desert soils from further erosion. Over 100 acres of desert pavement are known to occur within the study area.

The coarsest depositional materials derived from mountainous parent rock are generally found on the upper regions of the high plains; the finest materials are along the valley floors. The soils of the upper bajadas (or coalescent alluvial fans along the bases of mountain ranges) consist of coarse gravels grading into loamy gravels toward the toe of the alluvial fans. The soils of the lower bajadas grade from sandy loams to finer loamy materials. Playas located at the bottom of the basins accumulate silts and clays, and generally develop salt pans (Shaw et al. 1990).

The higher mountains of the study area are excessively drained, very stony or rocky, sandy loams to sands that are derived from nearby parent material. These soils develop on strongly sloping to very steep upland slopes of 9 to 75 percent. Rock outcrops cover 30 to 90 percent of the ground surface area. Where present, soil depth is seldom more than 10 inches.

The desert soils that develop on the alluvial fill in the study area are generally light in color, deficient in phosphorus and nitrogen, and lacking in organic matter. Except on river terraces and a few other older alluvial land forms, the soils have little profile development.

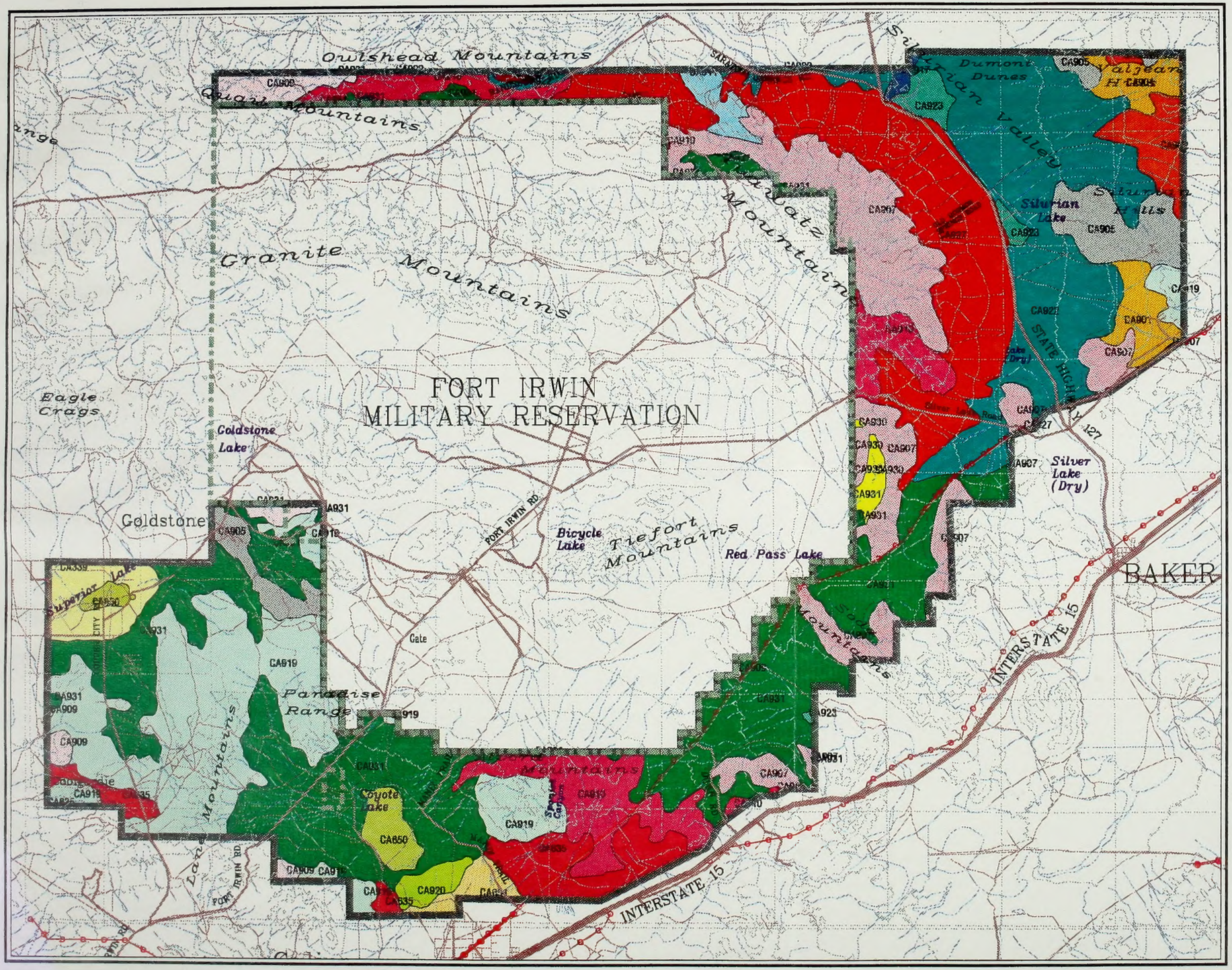
3.3.2 Soil Mapping Units

The 1993 SCS STATSGO data identified 17 soil series within the study area (Figure 3.3-1). The areal extent (in acres) and percent of the total soil coverage within the study area are estimated for each of these mapped soil units in Table 3.3-1. Each of these map units is briefly described in the following sections. Most of the soil descriptions were obtained from a computer database maintained by the SCS office in Sacramento, California. The Gunsight and St. Thomas series descriptions were provided by the Las Vegas, Nevada, office of the SCS. The Arizona State Office of the SCS provided the Schenco series description.

3.3.2.1 Adelanto Soils

Adelanto soils comprise approximately 3.5 percent of the study area. They are fine sandy loams and sandy clay loams that occur on nearly level to gently sloping alluvial fans and plains at elevations from 2,000 to 2,900 feet above MSL. They are mostly derived from granite and closely related rocks.

Adelanto soils are well drained and have moderately slow permeability and runoff, and slight water and wind erosion hazard potentials. They are used mainly for recreation and urban use. Limited agricultural production occurs where irrigation water systems have been developed.



Explanation

- Rosamond 339
- Cajon 635
- Playas-Cajon 650
- Cajon-Bryman-Halloran-Norob 651
- Arizo 901
- Nickel-Blackmount-Arizo 902
- Rock Outcrop 905
- Tecopa-Rock Outcrop 907
- Upspring-Rock Outcrop 909
- Badland 910
- Badland-Beeline-Rositas 911
- Rock Outcrop-Lithic Torriorthents 913
- Schenco-St. Thomas-Rock Outcrop 917
- Cal Vista-Rock Outcrop 919
- Cajon-Dune Land 920
- Carrizo-Rositas 922
- Playas-Rositas 923
- Gunsight-Rillito 927
- Nickel-Arizo-Bitter 930
- Cajon-Arizo 931
- Power/Transmission Lines

Entire Study Area
SOIL CLASSIFICATIONS
Figure 3.3-1

Chambers Group, Inc.
5 25 125 0 5 Miles
1" = 30000'
Project# 6347
November 22, 1996

November 22, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

Table 3.3-1

TOTAL ACREAGE AND PERCENT TOTAL COVERAGE OF THE STUDY AREA BY SOIL SERIES

Soil Series	Acreage in Study Area	Total Soil in Study Area (percent)
Adelanto	21,620.15	3.5
Arizo	19,304.52	3.1
Badland	41,749.12	6.7
Blackmount	10,315.06	1.7
Cajon	146,939.39	23.5
Calvista	87,859.48	14.0
Dune Land	3,941.28	0.6
Gunsight	73,862.16	11.8
Lithic Torriothents	907.76	0.1
Nickel	3,360.94	0.5
Playas	13,324.91	2.1
Rosamond	12,247.27	2.0
Rositas	88,444.40	14.1
Schenco	1,268.74	0.2
St. Thomas	23,066.24	3.7
Tecopa	66,612.62	10.6
Upspring	11,095.96	1.8
Total	**625,920**	**100.0**

3.3.2.2 Arizo Soils

Arizo soils comprise approximately 3.1 percent of the study area. They are very deep gravelly sands and very gravelly coarse sands that formed in mixed alluvium on slopes from 0 to 15 percent at elevations ranging from 750 to 4,500 feet MSL on recent alluvial fans, fan aprons, and channels. Arizo soils are excessively drained and have very rapid permeability, slow runoff, and slight to moderate erosion hazard potentials. They are used mainly for recreation, wildlife, and urban purposes, with limited grazing in some areas.

3.3.2.3 Badland

Approximately 6.7 percent of the study area is comprised of Badland. This unit occurs on cliffs and bluffs with steep and very steep slopes. It is dissected by numerous intermittent drainages that have cut into the more erodible geologic material. Included in this unit are small areas of other soil series (such as Cajon Sand in drainages and Lithic Torriothents on uplands). Runoff is very rapid and the hazard of water erosion is very high. Geologic erosion is active. Drainage and permeability vary from one area to another. The unit is used mainly for wildlife habitat.

3.3.2.4 Blackmount Soils

Blackmount soils cover approximately 1.7 percent of the study area. These soils are gravelly sandy loams found on dissected old alluvial fans with 1- to 8-percent slopes at elevations between 2,500 and 3,600 feet MSL. Soils of this series are well drained and have moderate permeability. Eighty percent of Blackmount soils are mantled with a desert pavement consisting of pebbles. Areas with these soils are primarily used for grazing and wildlife habitat.

3.3.2.5 Cajon Soils

Cajon soils comprise approximately 23.5 percent of the study area. These soils are found on 0- to 9-percent slopes at elevations from 200 to 4,000 feet MSL on alluvial fans and river terraces. Cajon soils consist of very deep, calcareous sands and fine sands that have developed in stratified sandy alluvium. Cajon soils are somewhat excessively drained and have rapid permeability and very slow runoff characteristics. The water erosion potential is slight and the wind-erosion potential is moderate to high. The soils are used for recreation, cropland, and wildlife.

3.3.2.6 Calvista Soils

Calvista soils comprise approximately 14 percent of the study area. These soils are found on slopes to 15 percent on elevations from 1,000 to 4,000 feet MSL and are characteristic of upland foothills, ridges, buttes, and domes. Calvista soils are shallow to moderately deep sandy loams and calcareous sandy loams that developed in residuum from granite and other closely related rocks.

Calvista soils are well drained and have moderate to moderately rapid permeability and medium runoff characteristics. Wind and water erosion hazard potentials are moderate. Calvista soils are used mainly for recreation and wildlife.

3.3.2.7 Dune Land

Dune lands comprise approximately 0.6 percent of the study area. This unit is found on slopes ranging from 0 to 30 percent at elevations from 1,700 to about 2,800 feet MSL. It consists of well to excessively drained sands that developed from stratified alluvium. The unit is characterized by hills or ridges of sand-sized particles drifted and piled up by the wind and either actively shifting or so recently fixed or stabilized that no soil horizons have developed. Dune lands have slow runoff and slight water erosion hazard potentials; the wind erosion hazard potential is high. Dune lands are primarily used for recreation and wildlife.

3.3.2.8 Gunsight Soils

Approximately 11.8 percent of the study area is covered by soils of the Gunsight series. These very gravelly loams are found on slopes of up to 40 percent at elevations between 450 and 2,600 feet MSL. Gunsight soils are very deep and formed in stratified alluvium on stream or fan terraces. They are somewhat excessively drained and have moderate runoff and permeability characteristics. Gunsight soils are primarily used for livestock grazing and recreation.

3.3.2.9 Lithic Torriothents

Lithic torriothents comprise approximately 0.1 percent of the soils found within the study area. They generally occur in areas between rock outcrops, in small depressional areas, and on relatively stable hillsides. Slopes are hilly or steep and range from 15 to 50 percent. Lithic Torriothents tend to be shallow or very shallow and intricately intermingled with granitic rock outcrops. They range in texture from sandy loams to very gravelly sands. Color, texture, and depth vary from one area to another. Permeability of the unit is very rapid to rapid. Runoff is moderate to rapid, and water erosion hazard is high. The hazard of blowing soil is slight. The unit is mainly used as wildlife habitat.

3.3.2.10 Nickel Soils

Soils of the Nickel series comprise approximately 0.5 percent of the study area. Nickel soils are gravelly and very gravelly sandy loams that formed on erosional fan remnants and pediments, on slopes ranging from 0 to 30 percent at elevations from 2,000 to 4,000 feet MSL. The soils are very deep and formed in alluvium from mixed rock sources. Nickel soils are well drained and have moderately slow permeability.

3.3.2.11 Playas

Playas comprise approximately 2.1 percent of the study area. They occur in very poorly drained areas of flats and closed basins at elevations from 1,700 to 3,200 feet MSL. Playa soils are very poorly drained, have very slow runoff, and may be ponded for short periods at infrequent intervals. They are saline-alkaline and range in clay content and texture from silty clay to loamy sand. The hazard of soil blowing for this unit is very high when the soil is dry. The unit is used mainly for recreation and as wildlife habitat, but it is also occasionally mined.

3.3.2.12 Rosamond Soils

Rosamond soils comprise approximately 2 percent of the study area. These are very deep fine sandy loams found on 0- to 2-percent slopes at elevations from 1,700 to 3,000 feet in basin areas immediately adjacent to playa lakes. They have mainly formed in material derived from weathered granitic alluvium, and in some areas the soil is topped by a thin patchy crust of salt.

Rosamond soils are moderately well drained to well drained and have moderately slow permeability. Runoff is medium and the water erosion hazard is slight. The hazard of soil blowing is moderate. These soils are used as wildlife habitat, grazing, and cropland.

3.3.2.13 Rositas Soils

Rositas soils comprise approximately 14.1 percent of the study area. These soils are very deep, fine sands found on 0- to 30-percent slopes with hummocky or dune micro-relief. The soils formed in sandy windblown material derived from recent alluvium.

Rositas soils are excessively drained, with very slow runoff and rapid permeability characteristics. Rositas soils are used for cropland and wildlife habitat.

3.3.2.14 Schenco Soils

Schenco soils comprise approximately 0.2 percent of the study area. They occur on hillside slopes ranging from 3 to 60 percent at elevations from 1,500 to 3,200 feet MSL. These very shallow to shallow channely loams formed in slope alluvium derived from schist.

Schenco soils are well drained and have medium to rapid runoff and moderate permeability. They are used mainly for grazing and wildlife habitat.

3.3.2.15 St. Thomas Soils

St. Thomas soils comprise approximately 3.7 percent of the study area. They are very cobbly loams that occur on hills and low mountain slopes ranging from 8 to 75 percent at elevations of 1,800 to 4,500 feet MSL. These shallow soils formed in residuum derived from limestone and dolomite. St. Thomas soils are well drained and exhibit medium to rapid runoff and moderately rapid permeability. They are used chiefly for rangeland and wildlife habitat.

3.3.2.16 Tecopa Soils

Tecopa soils comprise approximately 10.6 percent of the study area. They are very gravelly sandy loams that occur on low hills and low mountain slopes ranging from 15 to 75 percent at elevations of 1,500 to 5,000 feet MSL. Tecopa soils are very shallow and formed in residuum and colluvium weathered from quartzite, schist, and gneiss. Permeability is moderate. The soils are used for rangeland and wildlife habitat.

3.3.2.17 Upspring Soils

Soils of the Upspring series cover approximately 1.8 percent of the study area. They are found on hills, mountains, and plateaus with slopes ranging from 15 to 50 percent at elevations of 1,600 to 4,200 feet MSL. These shallow soils are very stoney loams and very stoney sandy loams that formed in material weathered from extrusive basic igneous rocks. Upspring soils are somewhat excessively drained and have rapid runoff and moderately rapid permeability characteristics. The soils are used for wildlife habitat and recreation land.

3.4 WATER RESOURCES

3.4.1 Groundwater

Groundwater is stored within the soils and rock strata in the study area. Recharge to aquifers underlying the study area occurs through direct infiltration of precipitation, subsurface flow from adjoining valley groundwater basins, and runoff and subsequent infiltration of flash flood waters originating in the surrounding mountainous areas.

Water-bearing units in the study area can be broadly divided into two main types: consolidated materials (rocks) and unconsolidated deposits. The formations within these groups have dissimilar water-bearing characteristics. The unconsolidated deposits form the valley floor and contain most of the groundwater that is stored in the area. Consolidated rocks form the surrounding mountains and hills and underlie the unconsolidated deposits on the valley floor. Runoff from the mountains and hills contributes a major portion of the recharge to the groundwater contained in the unconsolidated deposits.

The California Department of Water Resources (CDWR) has divided the state according to the major groundwater drainage basins. The study area lies within the 6,000-square-mile Amargosa Drainage Basin of the 27,000-square-mile South Lahontan Subregion (CDWR 1964). In the South Lahontan Subregion, 50 valley-fill areas (or basins) have been identified as significant sources of groundwater. Portions of the study area fall within the following five groundwater basins:

- Death Valley Basin,
- Denning Spring Valley Basin,
- Valjean Valley Basin,
- Riggs Valley Basin, and
- Coyote Basin.

The following three groundwater basins are found within the existing NTC area:

- Bicycle Basin,
- Langford Basin, and
- Irwin Basin.

These basins are shown on Figure 3.4-1. General basin characteristics and groundwater availability of each of these basins are described in the following section.

The use of the term "well" in this discussion indicates an improved groundwater extraction system and associated water use. The term "spring" in this discussion refers to geographic place names only (e.g., Denning Spring Valley Basin) and not to any extraction or use of groundwater, although references to groundwater quality for particular basins may be derived from samples obtained from unimproved springs (e.g., Salt Spring in the Valjean Valley Basin).

3.4.1.1 Basin Characteristics and Groundwater Availability

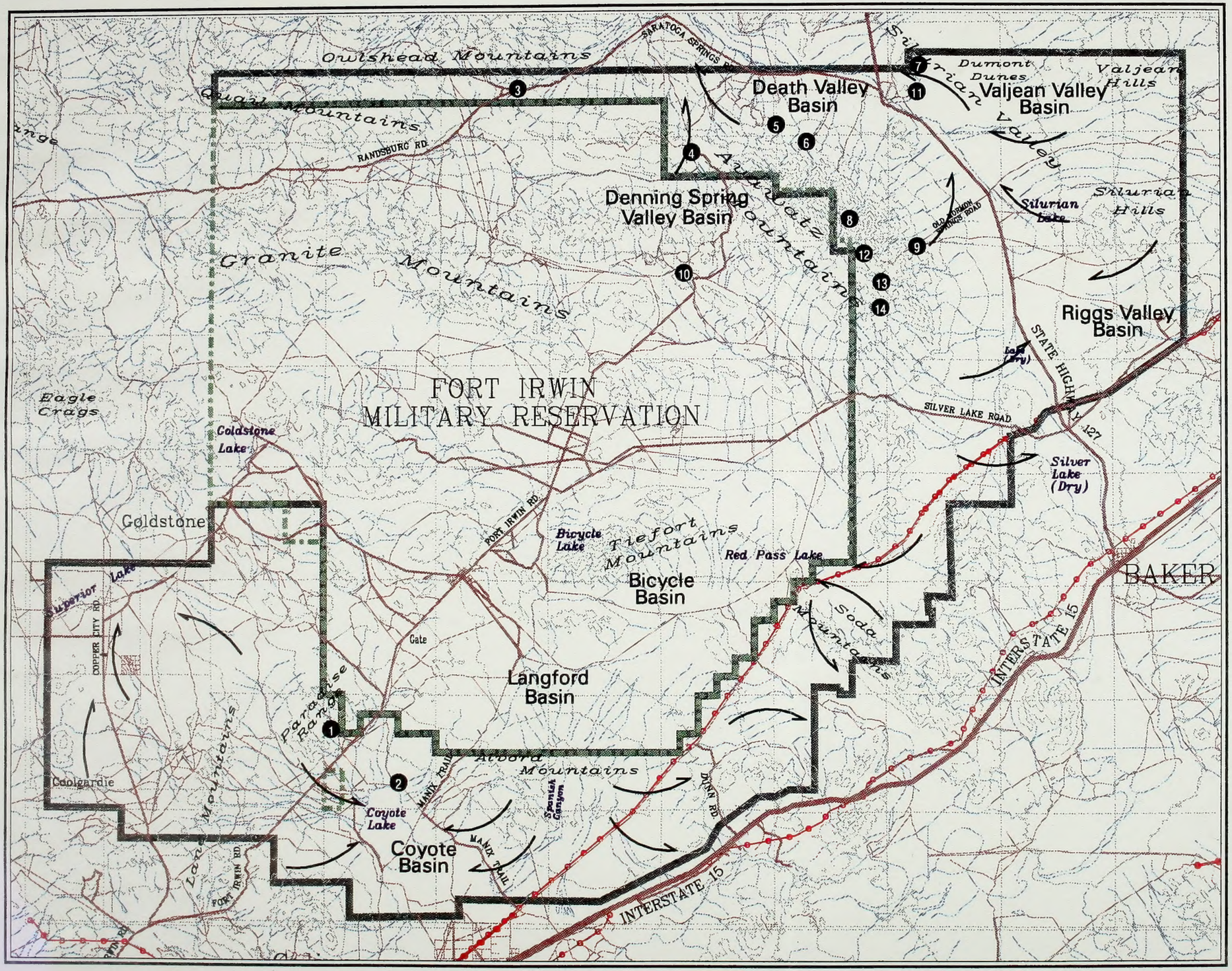
Few water wells have been drilled in the study area; therefore, limited data exist concerning depth to groundwater throughout the area. No known active wells or other groundwater extractions occur within Death Valley, Denning Spring Valley, Valjean Valley, or the Riggs Valley Basins. Historically, however, groundwater was withdrawn from wells at Denning Spring in the Avawatz Mountains, Riggs Mine in the southwest Silurian Hills, and the southeast end of Silurian Dry Lake (Mendenhall 1909). The Bicycle, Irwin, and Langford Basins are used to supply the current water needs of Fort Irwin. The Coyote Basin could also be developed as a groundwater resource for the NTC, if required.

Death Valley Basin

Death Valley Basin extends southeasterly from the California-Nevada state line through the northwestern part of Inyo County into northern San Bernardino County. This basin, which has an area of approximately 1,316 square miles, is approximately 150 miles long and extends almost the entire length of the Amargosa River Drainage Basin.

Denning Spring Valley Basin

The Denning Spring Valley Basin is a small elongate, northwesterly trending area of about 12 square miles. The Avawatz Mountains nearly encircle the basin. The basin floor slopes in a northwesterly direction and ranges in elevation from approximately 5,400 to 1,600 feet.



Explanation

1. Paradise Spring
2. Jackrabbit Spring
3. Owl Hole Spring
4. Denning Spring
5. Cottonwood Spring
6. Sheep Creek Spring
7. Salt Spring
8. Unnamed Spring
9. Old Mormon Spring
10. Cave Spring
11. Amargosa Spring
12. Limestone Spring
13. Tin Cabin Spring
14. Weaverdick Spring

General Direction of Drainage

Power/Transmission Lines

Entire Study Area
HYDROLOGIC FEATURES, SPRINGS, AND DRAINAGE
Figure 3.4-1

Chambers Group, Inc.

5 2.5 1.25 0 5 Miles

1" = 30000'
Project# 6347
December 04, 1996

December 04, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

The water level in the Denning Spring Well, the only known well within the Denning Spring Valley basin, has been within 4 feet of the ground surface since at least 1917.

Valjean Valley Basin

The Valjean Valley Basin is an irregularly shaped area of approximately 293 square miles bounded on the north by the Kingston Range and Dumont Hills, on the east by the Shadow Mountains, on the south by the Silurian Hills, and on the west by the Avawatz Mountains. The basin floor generally slopes to the west from an elevation of approximately 3,000 feet to approximately 500 feet near Salt Spring. Silurian Lake, in the southern part of the basin, covers an area of approximately 2.1 square miles.

According to Thompson (1929), the water table throughout the Valjean Valley Basin probably does not rise much above the water level of Salt Spring (approximately 550 feet), and water could be reached by drilling to depths below that of Salt Spring. The (U.S. Geological Survey [USGS] 1969) estimated that the storage capacity of the Valjean Valley groundwater basin is approximately 3.39 million acre-feet.

Riggs Valley Basin

Riggs Valley Basin is an irregularly shaped area of approximately 99 square miles. It is bounded by an alluvial high on the north, a series of low hills on the east and southeast, the Soda Mountains on the south, and the Avawatz Mountains on the west. The most recent available data on the Riggs Valley Basin are from exploratory borings and two monitoring well installations in 1989 adjacent to the abandoned Tonopah and Tidewater Railroad and south of an unmaintained road through the abandoned siding at Riggs (Section 10, Township 9 North, Range 8 East, San Bernardino Baseline and Meridian). Depth to groundwater in these wells was between 340 and 492 feet below ground surface (bgs).

The USGS (1969) estimated that the storage capacity of the Riggs Valley groundwater basin is 1.19 million acre-feet in the zone from 100 to 300 feet bgs.

Bicycle, Langford, Irwin, and Coyote Basins

These four basins are all bowl-shaped aquifers filled with water-bearing unconsolidated deposits. Three producing wells have been drilled in Bicycle Basin, three in Langford Basin, and five in Irwin Basin to meet the current water needs of Fort Irwin (U.S. Department of Agriculture [USDOA]/NTC 1988b). Depth to groundwater in each of these four basins is between 100 and 300 feet bgs.

3.4.1.2 Quality

Generally, water-bearing deposits beneath playa lakes and lower portions of centripetal, bowl-shaped aquifers in the Mojave Desert are too saline for most beneficial uses. However, by blending waters from several wells, total dissolved solids (TDS) can be reduced to suitable levels (generally less than 1,000 milligrams per liter [mg/L]) for beneficial or consumptive uses.

Representative groundwater quality data from existing base wells and other wells in the study area are presented in Table 3.4-1. A 1980 water quality database was subsequently expanded with groundwater monitoring data collected and analyzed by a hydrogeological consultant under contract to the NTC (USDOA/NTC 1988c). Groundwater quality in the study area varies from good to poor, depending on the location of the source well. Groundwater quality in each of the basins is briefly described below.

Death Valley Basin

Groundwater in the southern half of Death Valley is of inferior quality due to excessive amounts of salts that accumulated as the water moved through the saline sediments and salt deposits. Some surface waters, including Salt Creek and the Amargosa River, also accumulate salts as they flow through saline deposits on their way toward Badwater. By the time groundwater reaches Badwater, TDS content may exceed 40,000 parts per million (ppm).

Denning Spring Valley Basin

Water from Denning Spring Well is rated marginal for domestic use, based on a fluoride content of 1.2 ppm. Fluoride in drinking water is beneficial in small concentrations; however, with higher concentrations, long-term drinking can lead to fluorosis. The TDS

Table 3.4-1

SUMMARY OF GROUNDWATER MINERAL QUALITY FORT IRWIN AREA

Constituent	Units	Well Number / Date									
		Bicycle Basin		Irwin Basin				Langford Basin		Coyote Basin	EPA Limits
		BX-1 10/80	BX-2 10/80	IX-1 09/80	IX-2 10/80	IX-3 10/80	IT-1 12/80	LT-1 12/80	LX-1 12/80	CX-1 12/80	
Na	mg/L	239	901	137	107.4	134	121	175	145.7	159	
K	mg/L	6.4	18.8	13.5	7.7	9.0	9.6	2.3	3.0	4.4	
Ca	mg/L	33.6	21.9	18.5	21.5	21.5	20.1	4.9	8.4	17.0	
Mg	mg/L	9.2	6.4	2.1	6.1	3.6	3.6	3.1	3.4	9.2	
HCO_3	mg/L	195.1	239.4	151.3	126.9	151.6	144.1	253.8	204.3	135.5	
SO_4	mg/L	125.1	338	137	111.2	109.7	126	125.6	68.5	205	250
NO_3 (as N)	mg/L	10	3.2	5.7	3.3	1.8	1.44	1.7	2.2	5.3	45
Cl	mg/L	181.4	1004.1	55.9	54.2	56	65	52.7	49.6	66.4	250
Si	mg/L	43.8	77.0	75.7	28.0	59.5	65	10.8	24.5	30.5	
F	mg/L	2.0	8.1	6.0	3.3	5.8	5.9	6.5	1.5	1.4	140
B	mg/L	0.6	3.2	0.9	0.3	0.55	0.6	0.5	0.4	0.9	
pH	units	8.2	8.3	8.2	8.1	8.1	7.9	7.8	8.3	8.1	6.5-8.5
EC	umhos/cm	1205	3950	750	660	740	705	690	890	1600	
Color	S.C.U.[1]	4	23	10	9	5	14	15	6	16	
Turb.	T.U.[2]	8.5	52	18	2.5	0.53	0.48	0.6	3.6	0.4	
TDS	mg/L	790	2439	544	430	487	452	501	438	508	
Hardness	mg/L	121.8	81.0	54.8	78.8	68.5	65.0	25.0	35.0	80.3	
MBAS	mg/L	- - -	- - -	0.04	0.09	0.08	- - -	- - -	0.05	- - -	0.05
TOC	mg/L	0.88	1.21	0.97	- - -	0.39	0.65	1.13	1.50	- - -	

Table 3.4-1

SUMMARY OF GROUNDWATER MINERAL QUALITY FORT IRWIN AREA

Constituent	Units	Well Number / Date									
		Bicycle Basin		Irwin Basin				Langford Basin		Coyote Basin	EPA Limits
		BX-1 10/80	BX-2 10/80	IX-1 09/80	IX-2 10/80	IX-3 10/80	IT-1 12/80	LT-1 12/80	LX-1 12/80	CX-1 12/80	
Fe	mg/L	0.4	5.5	- - -	1.4	0.5	0.1	- - -	1.4	0.4	0.30
Mn	mg/L	0.017	0.2	- - -	0.049	0.032	0.003	- - -	0.44	0.007	0.05
Cu	mg/L	0.005	0.007	- - -	0.005	0.005	0.086	- - -	0.005	0.1	1.00
An	mg/L	0.041	0.4	- - -	0.060	0.1	0.029	- - -	0.072	0.092	5.00
Cd	mg/L	0.003	0.003	- - -	0.003	0.003	- - -	- - -	0.003	- - -	
Cr	mg/L	0.010	0.015	- - -	0.010	0.10	- - -	- - -	0.010	- - -	
Ba	mg/L	0.05	0.07	- - -	0.03	0.04	- - -	- - -	0.03	- - -	
Pb	mg/L	0.003	0.003	- - -	0.003	0.003	- - -	- - -	0.003	- - -	
As	mg/L	0.006	0.024	- - -	0.003	0.004	- - -	- - -	0.005	- - -	
Se	mg/L	0.004	0.007	- - -	0.004	0.004	- - -	- - -	0.004	- - -	
Ag	mg/L	0.008	0.010	- - -	0.008	0.008	- - -	- - -	0.008	- - -	
Hg	mg/L	0.001	0.0006	- - -	0.003	0.001	- - -	- - -	0.0001	- - -	

[1] S.C.U. = Standard Color Units
[2] T.U. = Turbidity Units
Source: MBA 1991

concentration of the well water is approximately 450 ppm, and the water is characterized as the calcium-sodium bicarbonate type (CDWR 1964).

Valjean Valley Basin

Water quality data for Salt Spring are probably representative of the Valjean Valley Basin. Since 1918, the TDS content of Salt Spring has ranged from 5,385 to 8,540 ppm. Water quality data from monitoring wells installed by U.S. Ecology (USE) (1989) near the former Riggs Station at the base of the southern Silurian Hills revealed high fluoride and boron concentrations. Electrical conductivity ranges from 1,400 to 3,000 umhos/cm, and the pH tends to be neutral or slightly basic with pH values from 7 to 8.1.

The groundwater is characterized as the sodium-chloride type and is inferior for domestic uses (CDWR 1964).

Riggs Valley Basin

Based on data from a well near the intersection of Power Line Road and State Highway 127 at the southern project boundary, water quality of this basin is inferior for irrigation and domestic purposes. High fluoride (4.0 ppm), chloride (620 ppm), TDS (1,740 ppm), and percent sodium (80 percent) are the causes of this inferior quality (CDWR 1964).

The quality of the groundwater in the Riggs Valley Basin is affected by the subsurface inflow of groundwater from the Silver Lake Basin to the southeast. The groundwater is characterized as the sodium-chloride type.

Bicycle Basin

Data from wells in the Bicycle Basin indicate TDS concentrations in the 400- to 800-mg/L range (William F. So and Associates 1989).

Chemical constituents occurring in concentrations higher than EPA drinking water criteria include iron, chloride, manganese, and fluoride, with fluoride consistently exceeding the applicable standard.

Other significant chemical constituents in the Bicycle Basin's groundwater are calcium, sodium, bicarbonate, and sulfate. The groundwater tends to be somewhat alkaline because of these constituents (USDOA/NTC 1988c). In addition, nitrate levels in wells approach the 45-mg/L drinking water criterion.

Langford Basin

The chemical constituent levels detected in wells in the Langford Basin are similar to those in the Bicycle Basin wells, except that nitrate levels are moderate.

Coyote Basin

The chemical constituent levels found in the Coyote Basin groundwater are similar to those found in the Bicycle, Langford, and Irwin Basins.

3.4.1.3 Groundwater Use

Availability

The Mojave River, which is the primary subsurface water source for the region, does not currently supply water to Fort Irwin and is not considered a potential future water source. Water for Fort Irwin currently comes solely from 11 producing wells tapping the Bicycle, Langford, and Irwin Basins (USDOA/NTC 1992). Locations of basins are shown on Figure 3.4-1. Depth to groundwater at these wells is between 100 and 300 feet bgs.

Fort Irwin consumes an average of 2.5 million gallons of water per day (mgd). About 60,000 gallons per day of this demand are used outside of the cantonment area for field activities involving troop maneuvers. Based on the Water Supply Master Plan (Wilson F. So & Associates 1989), projections of daily demand will increase to 3.75, 4.11, and 4.36 mgd by the years 2000, 2020, and 2040, respectively.

Currently, there are no known active wells or other groundwater extractions occurring within the Silurian Valley portion of the study area, and the general lack of wells has precluded accurate assessment of the groundwater (hydraulic) gradient to date. Historically, however, groundwater withdrawals have occurred, from dependable wells at Denning Spring in the Avawatz Mountains, Riggs Mine in the southwest

Silurian Hills, and the southeast end of Silurian Dry Lake (Mendenhall 1909).

Quality

As discussed in Section 3.4.1.2, historical summaries of water quality data from active production wells in the Bicycle, Langford, and Irwin aquifers indicate that groundwater resources associated with the Bicycle, Langford, and Irwin aquifers typically exhibit TDS concentrations in the 400- to 800-mg/L range. It was also noted that groundwater quality varies from good to poor, depending on the location of the source well. Because of its brackish nature and high mineral content, water to be used for human consumptive uses, such as cooking and drinking, must be processed separately through a reverse osmosis treatment system before it is delivered to base housing at the NTC.

A routine groundwater monitoring program was implemented in April 1989 at Fort Irwin. Since that time, no groundwater quality contamination from toxic releases by base facilities or activities has been reported (State Lahonton Regional Water Quality Control Board [SLRWQCB] 1988). Groundwater monitoring wells were installed at the NTC's landfill, and a regular schedule of groundwater monitoring has been implemented. Leachate contamination from the NTC's landfillor sewage treatment facility has not been detected in the local groundwater of the Irwin Basin.

Fuel and oil spills associated with in-field maintenance of support vehicles during military exercises are frequently cleaned up by removing the contaminated soils to the designated landfill storage area. Subterranean transport of contaminants is typically inhibited by low total annual rainfall and depth of unconsolidated substrate above the groundwater table in recharge zones. Therefore, these small fuel and oil spills do not pose a significant threat to the groundwater.

3.4.2 Surface Water

As in most deserts, precipitation events throughout the Mojave Desert are highly variable in terms of frequency, duration, and location. Large-scale winter storms originating in the Pacific Ocean account for the majority of the precipitation. The remainder of the precipitation is generated by high-intensity thunderstorms originating in the Gulf of California or the Gulf of Mexico during the summer months. Floods resulting from these brief torrential rains account for a significant percentage of all desert erosion. If concentrated in a canyon, the result is a violent and spectacular flood wave of great erosive and transportive power. If it is spread over an open slope or bajada, a slower moving and less destructive sheet flow follows the rain (Mendenhall 1909).

In the past 45 years, average annual precipitation has been low with 2.5 inches falling annually in the northern portion of the Mojave Desert and 4.4 inches falling at Fort Irwin. Most of the scant annual rainfall (and minimal snow) occurs from November through March, with January being the wettest month. Rainfall in nearby Baker (south of the study area) averages approximately 3 inches annually, but is considerably higher at the upper elevations of the surrounding mountains (Moyle 1967). West of the Avawatz Mountains, at Bicycle Lake, an average of 2.5 inches of precipitation falls annually (Shaw et al. 1990).

A significant portion of the rainfall is lost to evaporation and plant transpiration as soon as it falls. Another portion quickly infiltrates into the porous alluvium of the desert floor and eventually reaches the saturated sediments underlying it at depth. The remainder finds its way directly into the ephemeral streams and washes that carry it to lakebeds and other sinks.

Because of the rugged and diverse topography, a great variety of surficial hydrologic features are found within the study area, including springs, seeps, ephemeral streams, and playas. The general drainage system and hydrologic features within the study area are described in the following subsections and shown on Figure 3.4-1.

3.4.2.1 Drainages

Surface water resources within Fort Irwin and in the vicinity of the study area are scarce. No perennial watercourses dominate this region. Washes descending from mountains and other elevated landforms are intermittent channels that route surface runoff downgrade into topographical depressions where temporary or ephemeral lakes are formed. Figure 3.4-1 depicts the general pattern of drainage in the study area.

During heavy runoff events, water in washes carries sand, gravel, cobbles, and even boulder-sized rocks as part of the bedload transport. Deposition of this

bedload material across less steep terrains has resulted in the formation of the alluvial fans commonly observed in this area. Significant subsurface flows may occur in the unconsolidated sand and gravel channel deposits found in washes and alluvial fans, even after surface flows have ceased. Local groundwater recharge may occur along washes because of this subsurface water movement. Without a drainage outlet, surface water in shallow ephemeral lakes is lost through groundwater percolation or evaporation.

The Silurian Valley is part of a large topographic low or trough that extends southward more than 50 miles from the southern end of Death Valley. North-flowing Salt Creek is the primary watercourse draining into southern Death Valley.

The Silurian Valley generally trends in a north-south direction, with tributary washes extending far back into the mountains to the east and west. The drainage basin as a whole exhibits a configuration similar to an inverted "L." Runoff from the bordering mountains flows across coalescent alluvial fans (or bajadas) toward the central valley floor.

Slopes of the south Avawatz range may drain into Dry Lake and Silver Dry Lake, with the southern tip possibly draining into Red Pass Lake. The lower northern and western slopes of the Soda Mountains may also drain into Red Pass Lake. The southwest slopes of the Soda Mountains and the northeast slopes of the Cronese Mountains may empty into West Cronese Lake.

A portion of the drainage southeast of Alvord Mountain contributes to the Mojave River, a large, dry wash with surface flows more than 5 miles south of the southern study area boundary and continuing to a dry lakebed 10 miles southeast of Fort Irwin. The western slopes of the Alvord Mountains likely empty into Coyote Lake, as may the southwestern slopes of Paradise Range, the northwestern slopes of the Calico Mountains, and the eastern slopes of Lane Mountain. The eastern slopes of Lane Mountain and the northern slopes of the Mud Hills likely empty into Superior Dry Lakes.

Drainage patterns over the western portion of the study area consist of flows that are directed into Pilot Knob Valley.

3.4.2.2 Playas

Playa lakes in the vicinity of Fort Irwin range from 338 to 1,297 acres in size (Corps 1987). These lakebeds dry rapidly, but contain surface water for 2 to 3 weeks following heavy rainfall. Impermeable clay deposits are formed by the continual deposition of fine suspended solids in runoff when the ponded water evaporates or percolates into the ground. Groundwater recharge to subsurface aquifers diminishes around playa lakes because of these impermeable clay layers, and ambient evaporation rates tend to dry the lake surfaces rapidly. Playa lakes may accumulate up to 3 feet of water.

3.4.2.3 Springs

Small springs within the study area offer isolated and limited pockets of perennial surface water, but none are of sufficient size to sustain perennial surface watercourses. Some springs produce potable water, but overall, water quality is poor because of high dissolved mineral concentrations and acidity levels that often exceed federal standards. Springs in the study area are depicted on Figure 3.4-1 and can be broadly placed into two categories: springs of the higher mountains and alluvial springs of the desert floor.

The mountain or "hillside" springs tend to be small, and their source or recharge area is usually within the immediate area. These springs usually dry up during drier periods, but may be abundant and furnish strong flows for a short time after a storm. They are often located in bare rocky gulches above the highly permeable alluvium of the valley floor. As a general rule, the water found at these higher elevation springs comes from rock free of alkalis and is relatively pure and sweet. A few examples of mountain springs in the study area are Denning, Sheep, Old Mormon, and Willow Springs in the Avawatz Mountains.

In contrast, springs of the alluviated valley floor tend to be larger and more permanent in nature. They usually lie along fault lines, which impede the flow of groundwater and thereby "compartmentalize" the alluvium into separate subbasins. Typically, the flow from these springs is too great to be accounted for solely on the basis of rainfall in the local area. They derive their flows from rising groundwater that has often traveled great distances over a considerable period of time. Total dissolved solids present in water derived from alluviated valley floor springs may reflect

long residence time of water in the subsurface and in some cases results in exceedence of general mineral and general physical standards for drinking water purposes.

Other springs are unfit for human consumption based on bacteriological analyses per federal standards. For example, Hidden Springs and Amity Springs, which are located on the Naval Air Weapons Station, were sampled and the results indicated high concentrations of fecal coliform (>2,400 ppm) and fecal streptococcus (460 ppm).

Thompson (1929) sampled and analyzed some of the springs in the study area in late 1917 and early 1918 as summarized below in Table 3.4-2. The results of the analysis show that surface waters from springs at higher elevations in the mountains (Sheep Creek and Cave Spring) tend to have low TDS concentrations and are relatively pure, compared to rising groundwater from springs on the valley floor (Owl Hole Spring and Salt Spring), which generally has high TDS concentrations. Springs are largely "leaks" from fault-intersected or confined and pressurized substrata; therefore, spring discharge volume and water quality vary with the local groundwater conditions.

3.4.2.4 Surface Water Quality

Very little development or human activity has occurred within most of the study area. The development that has occurred has been associated with the base, road construction, mining, and agricultural activities.

Most of the other activities that have occurred in the study area have been related to prospecting and mining. Chambers Group (1992a) conducted a Preliminary Assessment Screening (PAS) of the Silurian Valley portion of the study area and found that most of this historic mining activity has been concentrated in the Avawatz Mountains and Silurian Hills around the perimeter of the study area. Very little mining or other activity of any kind has taken place on the valley floor. The main materials mined included rock salt, talc, gypsum, and celestite. The mining processes for recovery of these minerals are unlikely to have resulted in significant surface water contamination.

A few isolated gold, lead, zinc, and silver mines were historically worked in the area. The most notable of these are the Riggs and Annex mines in the Silurian Hills, the Salt Spring Mine in the Salt Spring Hills, and the Denning Spring and Avawatz Crown mines in the Avawatz Mountains. Because of the types of ore being mined and the historic gold separation techniques used (such as mercury amalgamation and cyanide washing), some potential exists for localized contamination of surface water runoff in these areas. However, no current surface water contamination problems are known to exist within the study area.

Surface water is used within the study area for minor withdrawals associated with the intermittent manganese mill site operations at Owl Hole Spring and small extractions for nonpotable domestic purposes at the University of California Desert Studies Consortium research facility located at Sheep Creek Springs.

Within the study area, agricultural runoff from areas under cultivation may be a source of nonpoint source pollutants. The pollutants traditionally associated with these activities include suspended solids (eroded soil), herbicides, pesticides, and fertilizer nutrients. Agricultural activities that occur on a limited scale south of Coyote Basin may contribute to the Coyote playa lake, which acts as a long-term sedimentation basin for these materials. No sources of pollution or actual pollution at Coyote Lake are known to occur.

The potential for surface water and groundwater contamination from illegal operation and abandonment of clandestine drug laboratories and their associated chemicals is a growing cause for concern throughout the Mojave Desert region, including the study area.

Table 3.4-2

CHEMICAL ANALYSES OF SPRINGS IN THE STUDY AREA
(parts per million [ppm])

Constituent	Owl Hole	Salt Spring	Sheep Creek	Cave Spring
Silica (SiO2)	90	48	74	52
Iron (Fe)	0.38	0.19	0.05	0.29
Calcium (Ca)	41	256	71	96
Magnesium (Mg)	9.0	120	56	16
Sodium and Potassium (Na+K)	545	1,559	90	55
Carbonate radical (CO3)	22	0	5.8	30
Bicarbonate radical (HCO3)	175	313	186	155
Sulphate radical (SO4)	675	901	393	137
Chloride radical (Cl)	261	2,295	23	61
Nitrate radical (NO3)	29	1.8	0.23	5.7
TDS (@ 180 Centigrade)	1,804	5,385	860	535
Total Hardness as CaCO3	139	1,130	407	306
Year Sample Collected	1917	1918	1917	1917

Cave Spring is located in the Avawatz Mountains slightly west of the project boundary.
Source: Thompson 1929

3.5 BIOLOGICAL RESOURCES

3.5.1 Vegetation

The study area lies entirely within the Mojave Desert scrub biome of California (Turner 1982). This area is characterized by hot summers, cool winters, and a very dry climate. Average annual precipitation ranges from approximately 3 to 8 inches, depending on elevation, with most falling in winter and early spring. The species composition of Mojave Desert scrub has common elements with the Great Basin to the north and many succulent species common to the Sonoran Desert scrub biome to the south and east. The overall dominance of creosote bush (*Larrea tridentata*) and bursage (*Ambrosia dumosa*) is interspersed with washes, springs, playas, and mountainous topography that add to the species diversity of the Mojave Desert as a whole. Therefore, at the most simple and general level of community classification, the study area can be classified as a Mojave creosote bush scrub (Munz 1974), but a number of different plant communities can be identified at a finer scale of observation.

Methodology

Vegetation communities southwest, south, and southeast of the NTC were mapped using a combination of low-level color aerial photos and field surveys. Fifteen community types were mapped and classified in accordance with the California Natural Diversity Data Base (CNDDB) natural community system (Holland 1986). The community descriptions are adapted from reports produced by the USFWS (1988) and Bagley (1989).

Vegetation communities in the Silurian Valley, located north and east of the NTC, were mapped in March 1992(b) by Chambers Group. Botanists conducted reconnaissance-level community surveys of the study area and reviewed existing sources of information regarding the potential of the study area to support sensitive plant species. Sources used to compile a list of potential species included the CNDDB, Connie Rutherford of the USFWS, Tom Egan and Sharon Paris of the BLM, Mary Meyer of the California Department of Fish and Game (CDFG), Alden Seivers of BLM, and Mark Bagley (consulting biologist, Bishop, California) who had previously conducted surveys in the region. In September 1992, Chambers Group (1992c) conducted detailed community surveys. Mark Bagley conducted focused surveys for Tecopa bird's beak (*Cordylanthus tecopensis*) and evaluated the potential of the study area to support spring-flowering sensitive plant species. In April 1993, Mark Bagley conducted focused plant surveys for spring-flowering sensitive plants.

In April 1995, a sensitive plant species survey was conducted by Mark Bagley in conjunction with Chambers Group (Chambers Group 1995). The purpose of this field survey was to identify sensitive plant resources within the study area to the U.S. Army, which is the proponent of the expansion project, and to the BLM, which is the current managing agency of the study site.

Table 3.5-1 provides a summary of the 17 plant communities observed in the study area and the number of acres occupied by each community. Figure 3.5-1 shows the locations of the vegetation communities in the study area. Appendix D contains the species list of plants observed during surveys of the study area.

3.5.1.1 Mojave Creosote Bush Scrub

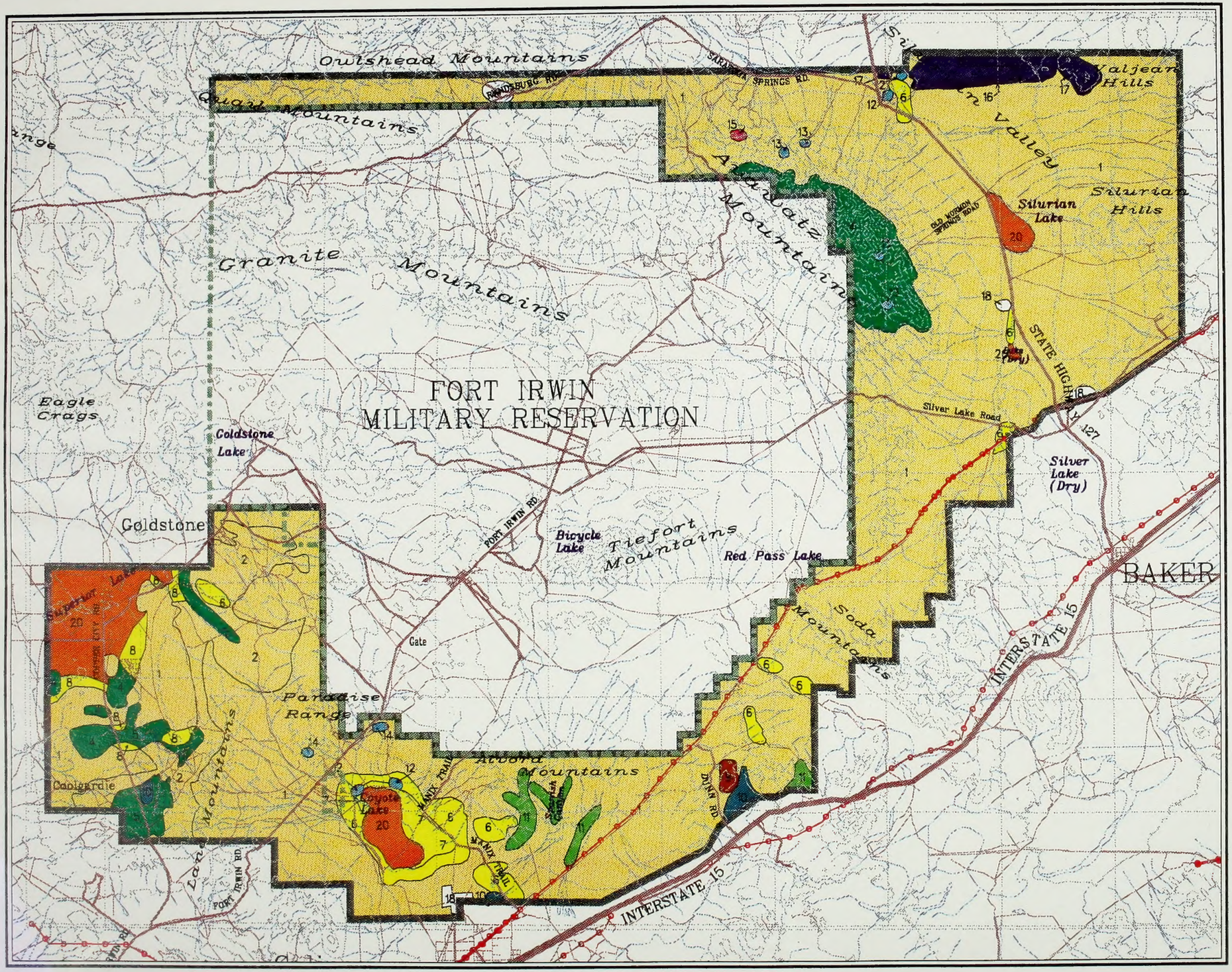
The Mojave creosote bush scrub community is characterized by the dominance of creosote bush. It forms an open shrub community 0.5 to 3 meters (m) tall with considerable bare ground between shrubs (Holland 1986; Vasek and Barbour 1977). It is usually found on well-drained soils, often on bajadas and low hills, and is not found in highly saline or alkaline soils. Areas without significant concentrations of this habitat are the steepest and rockiest slopes, washes, saltbush flats, and dry lakebeds. This is a widespread community type and the most common type found in the Mojave Desert below 4,000 feet (Holland 1986; Kuchler 1977; Rowlands et al. 1982; Vasek and Barbour 1977). The Mojave creosote bush scrub community is made up of a number of different associations. Different types of associations are recognized depending on the species that codominate with creosote bush. Variation in codominants is attributable to slope aspect and gradient, as well as substrate. Vegetation density varies from moderate on bajadas to extremely sparse on steep slopes and peaks. Mojave creosote scrub associations account for approximately 515,518 acres (82.3 percent) of the study area. This includes the 32,058 acres of Mojave creosote bush scrub/Joshua tree woodland mix.

The most common association is dominated by creosote bush and bursage and is found over vast areas

Table 3.5-1

PLANT COMMUNITY TYPES PRESENT IN STUDY AREA

Community Type	Acres	Percent Study Area
1. Mojave creosote bush scrub	483,513	77.2
2. Mojave creosote bush scrub/Joshua tree woodland mix	32,005	5.1
3. Joshua tree woodland	22,708	3.6
4. Joshua tree woodland/Mojave mixed woody scrub mix	9,897	1.6
5. Desert saltbush scrub	17,886	2.8
6. Desert sink scrub	3,954	0.6
7. Mojave mixed woody scrub	5,056	0.8
8. Crucifixion thorn woodland	1,005	0.2
9. Open playa or alkali playa	2,317	0.4
10. Mojave wash scrub	6,088	1.0
11. Freshwater seep or spring	735	0.1
12. Freshwater seep/Mojave wash scrub	557	<0.1
13. Alkali seep	403	<0.1
14. Saline hills	296	<0.1
15. Stabilized and partially stabilized desert sand fields	8,394	1.3
16. Active sand dunes and dunes/creosote bush scrub	2,456	0.4
17. Disturbed, no vegetation, dry lakebeds	28,650	4.6



Explanation

1. Mojave Creosote Bush Scrub
2. Mojave Creosote Bush Scrub/Joshua Tree Woodland
3. Mojave Creosote Bush Scrub/Desert Saltbush
4. Joshua Tree Woodland
5. Joshua Tree Woodland/ Mojave Woody Scrub Mix
6. Desert Saltbush Scrub
7. Desert Sink Scrub
8. Mojave Mixed Woody Scrub
9. Crucifixion Thorn Woodland
10. Open or Alkali Playa
11. Mojave Wash Scrub
12. Freshwater Seep or Spring
13. Freshwater Seep/ Mojave Wash Scrub
14. Alkali Seep
15. Saline Hills
16. Stabilized and Partially Stabilized Desert Sand Fields
17. Active Sand Dunes and Dune-Creosote Bush Scrub
18. Disturbance
19. No Vegetation
20. Dry Lakebed

Power/Transmission Lines

Entire Study Area
VEGETATION COMMUNITIES
Figure 3.5-1

Chambers Group, Inc.

5 2.5 1.25 0 5 Miles

1" = 30000'
Project# 6347
November 22, 1996

November 22, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

of the study area. In the eastern and northern portions of the study area, this association is located south, southeast, and north of the Soda Mountains, the Silurian Valley and Hills, Valjean Valley, and north and northwest of the Avawatz Mountains.

In the areas south, southwest, and southeast of the NTC, creosote bush-bursage association is found on the eastern and western sides of the Alvord Mountains, on the upper and middle bajada slopes, on most of the mountain slopes, east of Lane Mountain and the Paradise Range in the vicinity of Fort Irwin Road, on the lower bajadas and small basins, in sandy areas, and on desert pavement areas.

On some of the lower bajada slopes, particularly in the Coyote Basin, creosote bush is associated with allscale (*Atriplex polycarpa*), fourwing saltbush (*A. canescens*), and cheesebush (*Hymenoclea salsola*). In the sandy areas, it is associated with big galleta grass (*Pleuraphis rigida*).

On rocky outcrops and steep slopes throughout the study area, creosote bush becomes less dominant and is associated with a variety of species, including hop-sage (*Grayia spinosa*), burrobush (*Ambrosia dumosa*), desert tomato (*Lycium andersonii*), Nevada joint fir (*Ephedra nevadensis*), California desert buckwheat (*Eriogonum fasciculatum* var. *polifolium*), Cooper's goldenbush (*Ericamera cooperi* var. *cooperi*), and turpentine broom (*Thamnosma montana*). Creosote bush drops out completely on some of the steepest slopes.

On the upper bajada slopes above 3,000 feet and west and north of Lane Mountain and the Paradise Range, common creosote bush associates are cheesebush, goldenhead (*Acamptopappus sphaerocephalus* var. *sphaerocephalus*), hop-sage, burro bush, desert tomato, Nevada joint fir, winter fat (*Krascheninnikovia lanata*), turpentine broom, bladder sage (*Salazaria mexicana*), Mojave aster (*Xylorhiza tortifolia*), desert needlegrass (*Achnatherum speciosum*), and Cooper's goldenbush. The Mojave creosote bush scrub/Joshua tree woodland mixed community consists of these associates with an overstory of sparse Joshua trees (*Yucca brevifolia*). This community occurs as a transitional community between Mojave creosote bush scrub and Joshua tree woodland.

Species that occur predominantly in washes include cheesebush, California ephedra (*Ephedra californica*), spiny senna (*Senna armata*), desert tomato, Pima ratany (*Krameria erecta*), small-leaved indigo bush (*Psorothamnus arborescens* var. *minutifolius*), desert croton (*Croton californicus* var. *mohavensis*), button encelia (*Encelia frutescens*), peach thorn (*Lycium cooperi*), indigo bush (*Psorothamnus arborescens*), and sandpaper plant (*Petalonyx thurberi*).

3.5.1.2 Joshua Tree Woodland

The Joshua tree is endemic to the region; its range is approximately delineated by the extent of the Mojave Desert. Joshua tree woodland is recognized by the visual dominance of Joshua trees, an extremely conspicuous species that grows to 12 m. The woodland consists of a low, open, scrubby understory of various shrubs and perennial herbs with a Joshua tree overstory. The understory shrubs typically consist of representative species of Mojave creosote bush scrub, Mojave mixed woody scrub, blackbush scrub, or a sagebrush scrub community. Joshua tree woodland occurs at about 3,000 to 5,500 feet in sandy, loamy, or fine gravelly soils and usually on fairly gentle bajada slopes (Vasek and Barbour 1977). This plant community usually intergrades at lower elevations with Mojave creosote bush scrub and at higher elevations with pinyon-juniper woodland (Holland 1986). Within the study area, Joshua tree woodlands occupy approximately 22,708 acres (5.2 percent) of the study area. This includes the 9,897 acres of Joshua tree woodland/Mojave woody scrub mix.

Within the eastern and northeastern portions of the study area, Joshua tree woodland occurs at elevations above 3,000 feet in the Avawatz Mountains. In this area, California juniper (*Juniperus californica*) is a frequent codominant with Joshua tree. Vegetation density is moderate to high. Observations made during a helicopter flyover of this habitat indicate that it is largely in pristine condition, with few dirt roads and jeep trails causing disturbance.

South of the NTC, Joshua tree woodland was only observed above 3,000 feet in the southwestern portion of the study area where proper conditions (i.e., well-drained bajada slopes) occur. In the northwest, Joshua tree woodland is distributed in the Goldstone area, east into Superior Valley, and south to Lane Mountain. It was also observed south to the Mud Hills just outside the study area boundaries. These woodlands include understories of desert saltbush scrub, Mojave mixed woody scrub, and Mojave creosote bush scrub. Because the three types of understory scrub occur both

with and without a Joshua tree overstory, the vegetation map shows the distribution of each of the scrub types with an overstory of Joshua trees. The Joshua tree overstory is often quite sparse, particularly at the limits of its distribution where outlying individuals are often very widely spaced.

At the lower limit of this community in Superior Valley, Joshua trees occur on relatively flat slopes with an understory of desert saltbush scrub dominated by shadscale (*Atriplex confertifolia*), allscale, fourwing saltbush, winter fat, hop-sage, cheesebush, and big galleta grass. Slightly higher in the basin on the lower slopes of the bajada at elevations above 3,050 feet, the desert saltbush scrub understory intergrades with a more diverse Mojave mixed woody scrub dominated by hop-sage, winter fat, cheesebush, Cooper's goldenbush, desert tomato, Nevada joint fir, allscale, desert needlegrass, and big galleta grass. This Joshua tree-mixed woody association also occurs in the lower portions of the mesa west of Lane Mountain.

On the higher, slightly steeper and more well-drained slopes, the Mojave mixed woody scrub understory gives way to a diverse understory of Mojave creosote bush scrub dominated by creosote bush, hop-sage, cheesebush, burro bush, winter fat, goldenhead, Cooper's goldenbush, desert tomato, Nevada joint fir, turpentine broom, bladder sage, Mojave aster, and desert needlegrass. The upper limit of Joshua trees appears to be governed by the thinner soils on the upper bajadas and rocky ridges.

3.5.1.3 Desert Saltbush Scrub

Desert saltbush scrub is characterized by the dominance of one or more species of saltbush. This scrub forms a low, open shrub community dominated by gray-colored shrubs about 0.3 to 1 m tall, usually with few herbaceous plants. Saltbush scrubs are associated with moderately alkaline soil. Typically, one strongly dominant species of saltbush is found in association with several additional species in a particular area (possibly including other species of saltbush). It commonly occurs on lower bajada slopes and plains, and around playas throughout most of the Colorado, Mojave, and Great Basin Deserts (Holland 1986). It tolerates colder temperatures and more finely textured soils with higher salinity and/or alkalinity than does Mojave creosote bush scrub (Vasek and Barbour 1977).

In the general study area, species of saltbush observed include allscale, fourwing saltbush, shadscale, desert holly (*Atriplex hymenelytra*), and Mojave saltbush (*A. spinifera*). Other shrubs found within the study area in association with saltbush include winter fat, hop-sage, bud-sage (*Artemisia spinescens*), Acton encelia (*Encelia virginensis* ssp. *actoni*), and desert tomato. Saltbush scrub communities occupy approximately 17,886 acres (2.8 percent) of the study area.

In the Silurian Valley, east of the NTC, saltbush scrub associations occur in localized areas in the vicinity of Highway 127 at Salt Creek, east and southeast of the Avawatz Mountains, and southwest of the Soda Mountains.

In the south, southeast, and southwest, desert saltbush scrub is a widespread and variable community type. A saltbush scrub association dominated by desert holly occurs on some of the very dark volcanic formations found around Alvord Mountain and in the southeastern portion of the study area. Associated species include Acton encelia, burro bush, and allscale. This is a rather xeric association that is more widespread in the Death Valley region.

In the Coyote Lake basin, the saltbush scrub at the upper elevations is typically dominated by allscale and burro bush with occasional occurrences of fourwing saltbush and cheesebush. Cheesebush disappears closer to the playa, and big galleta grass appears on sandy sites. East of Coyote Lake, the slope is very gradual as is the transition between the allscale-burro bush association and the Torrey inkweed (*Suaeda moquinii*) dominated sink scrub that occupies that region. A more diverse and variable association occurs around the rest of the playa where the sink scrub is not as well developed. In that area, the dominance of allscale, fourwing saltbush, and shadscale shifts from place to place. Associated species include goldenbush (which can be locally abundant), burro bush, and Torrey inkweed, with occasional occurrences of desert tomato, peach thorn, and California ephedra.

In the Superior Valley area, desert saltbush scrub is found on the lowest bajada slopes and the flats of the basin up to the edge of the barren playas. In the area closest to the playas, the saltbush scrub is dominated by shadscale and, in some places, by Mojave saltbush, with bursage as the only common associate. The scrub becomes more diverse away from the playa with

the addition of other associates, such as allscale, fourwing saltbush, winter fat, and hop-sage. Near the upper reaches of the desert saltbush scrub in Superior Valley, allscale and fourwing saltbush become dominant. Associates include cheesebush, big galleta grass, winter fat, and hop-sage.

3.5.1.4 Desert Sink Scrub

Desert sink scrub is characteristically a lower, more widely spaced community than desert saltbush scrub. Halophytic (salt-adapted) succulents, such as Torrey inkweed, picklebush (*Allenrolfea occidentalis*), Mojave red sage (*Kochia californica*), and alkali pink (*Nitrophila occidentalis*), are the dominant species throughout the range of this community type in California. Saltbush species are generally a less important constituent here than in desert saltbush scrub. Desert sink scrub is found on poorly drained, usually clayey soils that have a high water table and a high salinity and/or alkalinity. It is typically found around playas and in moist alkali flats throughout the Mojave and Sonoran Deserts (Holland 1986). Desert sink scrub occupies approximately 3,954 acres (0.6 percent) of the study area.

Within the southern portion of the study area, desert sink scrub occurs only around the Coyote Lake playa where plant species diversity is very low. The dominant species are Torrey inkweed, allscale, and fourwing saltbush. Other succulent chenopod species are not found in this area.

3.5.1.5 Mojave Mixed Woody Scrub

Mojave mixed woody scrub is a poorly defined community that serves as a catch-all for vegetation that lacks creosote bush, saltbush, blackbush (*Coleogyne ramossisima*), or Joshua trees. It has been recognized under a variety of names by different botanists (Thorne et al. 1981) and occupies approximately 5,056 acres (0.8 percent) of the study area. It is typically considered a scrub community comprised of a highly variable mixture of shrubs with several species sharing dominance.

Mojave mixed woody scrub occurs sparingly in areas above 3,000 feet in the southwestern portion of the study area, such as at the top of Lane Mountain above 3,800 feet. This height is close to the upper elevational limit for creosote bush. The mixed scrub on Lane Mountain grows in thin rocky soils on steep to gentle slopes. The dominant species are burro bush, fourwing saltbush, California desert buckwheat, winter fat, hop-sage, Mojave aster, and desert needlegrass.

More extensive areas to the west and north of Lane Mountain are also dominated by Mojave mixed woody scrub. These occur on the midslopes of the bajadas, generally below Mojave creosote bush scrub and above desert saltbush scrub. Much of this area also supports Joshua trees and is discussed in Section 3.5.1.2. The dominant species in this scrub varies from place to place, and the transitions to Mojave creosote bush scrub and desert saltbush scrub generally are indistinct. Species commonly found include cheesebush, burro bush, hop-sage, winter fat, Cooper goldenbush, desert tomato, Nevada joint fir, allscale, desert needlegrass, and big galleta grass.

3.5.1.6 Crucifixion Thorn Woodland

Crucifixion thorn woodland is a desert woodland characterized by the dominance (at least visually) of a small shrub or tree called crucifixion thorn (*Castela emoryi*). It occurs on fine alluvial soils below 2,000 feet in only a few scattered localities in the Colorado and Mojave Deserts of California. It is more common in Arizona and in Sonora and Chihuahua, Mexico (Holland 1986). Crucifixion thorn woodland occupies approximately 1,005 acres (0.2 percent) of the study area.

One small area of crucifixion thorn woodland occupying approximately 99 acres occurs southeast of the NTC, north of State Highway 15, and west of the Cronese Mountains. This community is found at an elevation of 1,857 feet on the south edge of a small playa a few miles northwest of Afton Canyon. Soils are composed of deep silty sand, and the population is surrounded by a low-diversity creosote bush-burro bush scrub. This small patch of crucifixion thorn woodland is characterized by less than 50 scattered individuals. Common associates include creosote bush, cheesebush, burro bush, woolly brickelbush (*Brickellia incana*), California ephedra, big galleta grass, and mesquite (*Prosopis* sp.). This particular community is classified as an unusual plant assemblage (UPA) by the BLM. Crucifixion thorn is on List 2 of the California Native Plant Society (CNPS), meaning that the species is considered by the CNPS to be rare and endangered in California but more common elsewhere.

3.5.1.7 Open Playas/Dry Lakebeds

Open playas occur at the lowest elevations in closed basins where runoff temporarily collects after heavy rains. The waters that settle on the playa bring fine silts and clays that they deposit along with salts and minerals; thus, they are poorly drained and usually saline or highly alkaline. Playas are nearly flat and generally devoid of vegetation. Some playas support a patchy growth of a few annual species, often saltbush or nuttall monolepis (*Monolepis nuttaliliana*), or occasional clumps of low shrubby vegetation (usually saltbush or inkweed) that occur on mounds of soil elevated a few centimeters above the playa level. Open playas occupy approximately 2,317 acres (0.4 percent) of the study area.

Two playas or dry lakebeds occur in the Silurian Valley portion of the study area: the Silurian Dry Lake and Dry Sands Lake. Silurian Dry Lake is largely unvegetated except for a few small stands of chenopod scrub and salt cedar (*Tamarix* sp.). Inspection of the lake revealed the presence of groundwater at approximately 20 feet bgs. Dry Sands Lake, located west of State Highway 127, is vegetated with an abundance of annuals, and is the southern terminus of Salt Creek.

Large playas occur in Superior Valley, Coyote Lake, and Red Pass Lake. Several small playas also occur in Coyote Basin, east of Coyote Lake, and northwest of Afton Canyon. The two large playas in Superior Valley are barren except on the perimeter where occasional small patches of shadscale and bursage occur. The playas are surrounded by desert saltbush scrub dominated by these two species. Coyote Lake, a large open playa with a white alkaline clayey surface, is surrounded by alkali sink scrub. Although primarily barren, patches of scrubby vegetation do occur that consist primarily of allscale and Torrey inkweed. The small playas east of Coyote Lake are surrounded by open desert saltbush scrub with occasional clumps of allscale. The surface of these playas also consists of a white alkaline clayey substrate. A major access route (the Manix Tank Trail) running from the Manix train depot to Fort Irwin passes through these playas and is regularly used by military vehicles. A portion of Red Pass Lake occurs within the study area and consists of a barren open playa with no alkali salt crust. It is surrounded by Mojave creosote bush scrub dominated by creosote bush and rabbit thorn (*Lycium pallidum* var. *oligospermum*).

Three small playas are found northwest of Afton Canyon. The playas are surrounded by a low-diversity creosote bush scrub dominated by creosote bush and burro bush, and occupied by silty, gravelly soils with no alkali salt crust. The northernmost of the three playas is adjacent to the southern margin of the crucifixion thorn woodland.

3.5.1.8 Mojave Wash Scrub

Mojave wash scrub is a low, shrubby community with abundant open area between the shrubs. It occurs in sandy soils throughout the Mojave Desert in washes, arroyos, and canyons below 5,000 feet (Holland 1986). These areas experience periodic flooding from the intermittent streams that maintain the open character of this community. Characteristic shrub species for this community include cheesebush, wash rabbitbrush (*Chrysothamnus paniculatus*), allscale, pigmy-cedar (*Peucephyllum schottii*), spiny senna, woolly bricklebush, encelia, and sandpaper plant. In other areas, this scrub community may have a scattered to locally dense overstory of small trees such as cat claw (*Acacia greggii*), desert willow (*Chilopsis linearis* ssp. *arcuata*), smoke tree (*Psorothamnus spinosus*), honey mesquite (*Prosopis glandulosa* var. *torreyana*), and screw-bean mesquite (*Prosopis pubescens*) (Holland 1986; Thorne et al. 1981).

This community occupies approximately 6,088 acres within the study area. This acreage is most likely an underestimate because the vegetation in many of the smaller washes was not mapped. In addition, the vegetation in many of the dry washes in the study area is not sufficiently different from the surrounding scrub to warrant separation as Mojave wash scrub. An exception is made for Mojave wash scrub areas that support desert willow and mesquite because of their importance to wildlife and their infrequent occurrence in this portion of the Mojave Desert.

In the eastern and southwestern portions of the study area, Mojave wash scrub supports desert willow and mesquite. These areas experience periodic flooding from intermittent streams. Localized areas of these communities are found in the vicinity of the Cronese Mountains and the Avawatz Mountains.

Many of the larger washes scattered throughout the study area support Mojave wash scrub. Dominant shrubs include several species, such as wash rabbitbrush, woolly bricklebush, button encelia,

bladder sage, and sandpaper plant. Other common species also found at lower densities in the surrounding scrub include cheesebush, spiny senna, burro bush, allscale, fourwing saltbush, indigo bush, and California ephedra. These species are most commonly found in strictly shrubby associations that lack an overstory of small trees.

Desert willow communities occur in several broad, open, sandy washes in the vicinity of the Alvord Mountains and the Cronese Mountains, in Spanish Canyon on the eastern side of the Alvord Mountains, and in an unnamed wash on the eastern flank of the Avawatz Mountains. Isolated stands of mesquite are found in association with washes, playas, and springs near Paradise Spring, in a few hummocks at the north end of Coyote Lake, near the smaller playas a few miles east of Coyote Lake, and in one hummock near a small playa and wash in the crucifixion thorn woodland northwest of Afton Canyon. An extensive stand also occurs near the study area boundary in the braided washes at the northwestern end of West Cronese Lake.

3.5.1.9 Freshwater Seep

Freshwater seep communities are characterized by a dense growth of perennial herbs, especially sedges and grasses, and are found on permanently moist or wet soils around freshwater seeps (Holland 1986). These habitats are uncommon in the deserts of California. Freshwater seeps in the study area are dominated by mesquite and salt cedar, a nonnative tree that has invaded many wetland and riparian communities in the desert. Desert willows are also common in the freshwater seep associations. Density of the dominant woody species is generally high with little herbaceous understory.

In the Silurian Valley, this plant association is found near springs that were flowing at the time of the September surveys. Six springs that support wetland vegetation are located in the Silurian Valley portion of the study area. These are Sheep Creek Spring (which also supports a freshwater marsh), Cottonwood Spring, two unnamed springs east of the Salt Spring Hills, and two unnamed springs at higher elevations in the Avawatz Mountains. Preservation efforts are evident for Sheep Creek Spring (Desert Studies Consortium - California State University system) and the Salt Spring Hills area (Area of Critical Environmental Concern [ACEC] - BLM). Springs that are dry or have been intensively disturbed and the vegetation lost are Denning Spring, Owl Hole Spring, and Old Mormon Spring. Some mesquite and saltcedar are present at Amargosa Spring in the Salt Spring Hills, but mining activity at this location has compromised the integrity of this community.

Several small freshwater seeps occur within the southern portions of the study area. These are usually associated with surrounding alkali meadows. They are found at the Artesian Well site and Jack Rabbit Spring on the northern end of Coyote Lake, at Jack Spring near the existing NTC boundary and Fort Irwin Road, and at Paradise Springs.

The Jack Spring area contains two or three small pools of slowly seeping water surrounded primarily by saltgrass (*Distichlis spicata*). The two largest pools, approximately 4 feet and 1 foot in diameter, have been fenced and lined with concrete and contain very stagnant water. The remaining pools are less than 1 foot in diameter and may be dry during the hottest times of the year. The spring area has been heavily disturbed as evidenced by tire tracks, trash, spent ammunition (nonmilitary), and other debris.

Artesian Well and Jackrabbit Spring support cattails (*Typha* sp.) and rushes (*Juncus* sp.). The Jackrabbit Spring complex is also associated with a surrounding area of saturated soils constituting approximately 6 acres.

Paradise Springs, the largest spring complex in the study area and possibly in the entire vicinity of the NTC, is located almost immediately southwest of the Fort Irwin entrance in a valley in the Paradise Mountains. This spring complex occupies approximately 72 acres. Cemented bathing pools have been developed in two areas, with overflowing water supporting riparian vegetation in the canyon below these pools. The upper springs have not been extensively developed, and outflow continues to pass through the upper wash.

Common riparian plant species observed include honey mesquite, black and narrow-leaf willows (*Salix gooddingii* and *S. exigua*), Fremont cottonwoods (*Populus fremontii*), saltgrass, cattails, and the introduced and invasive salt cedar. Two plants of special interest, scaly stemmed sand plant (*Pholisma arenarium*) and giant stream-orchid (*Epipactis gigantea*), are found in this canyon. A few individuals of orchid were encountered at the edge of the upper riparian area while the sand plant is found in drier substratum. Twenty-one water-dependent plant species

were encountered in this area. A survey of the spring area conducted over a full year would almost certainly reveal more riparian species of plants.

3.5.1.10 Alkali Seep and Meadow

Alkali seep and meadow communities are characterized by a dense growth of perennial herbs, sedges, and grasses, and are found on more or less permanently moist or wet soils (Holland 1986). These habitats are found scattered throughout the deserts of California but account for only a tiny fraction of the total desert area.

Alkali seep and meadow communities surround the freshwater seeps noted above, as well as in two additional places at the north end of Coyote Lake and at Jack Spring. Characteristic species found in these areas include saltgrass, rushes, yerba mansa (*Anemopsis californica*), common reed (*Phragmites australis*), alkali sacaton (*Sporobolus airoides*), and Nevada blue-eyed grass (*Sisyrinchium halophyllum*).

3.5.1.11 Saline Hills

This feature occurs in a small, localized area on the north side of the Avawatz Mountains west of Cottonwood Spring. These hills are covered with a salt crust and are virtually unvegetated. The Saline Hills occupy approximately 296 acres (<0.1 percent) of the study area. The area is located in the northwestern portion of the Avawatz Mountains west of the Creek Mine.

3.5.1.12 Stabilized and Partially Stabilized Desert Sand Fields

This unique community occurs along the northeastern boundary of the study area west of the Valjean Hills. Sand verbena (*Abronia* spp.) is common. Perennial shrubs are virtually absent, but diversity of herbaceous species can be high. This type of flora reflects a low capacity of the soil to retain moisture, a feature that favors annual species that flower and set seed within a short period of time in the spring. Approximately 8,394 acres (1.4 percent) of the study area are occupied by this community. It is found in the northern part of Silurian Valley/Valjean Valley area and extends from Spring Mountain to the Valjean Hills.

3.5.1.13 Active Desert Dunes and Dunes/Creosote Bush Scrub

Dune systems are represented by the Ripple Dunes (also called the Little Dumont Dunes) at the northern border of the study area and in the Valjean Hills in the northeastern corner of the study area. In the Valjean Hills, dunes are intermixed with volcanic outcrops that support creosote bush scrub vegetation. Sandpaper plant (*Petalonyx thurberi* ssp. *thurberi*) is common in this area. Dunes occupy approximately 2,456 acres (0.4 percent) of the study area.

3.5.1.14 Disturbed Areas/Agricultural Lands

These areas are largely unvegetated except for nonnative species, such as salt cedar or agricultural crops. They do not include roads but represent visible scars on the landscape that have little resource value. Disturbed areas occupy approximately 3,052 acres (<0.1 percent) within the study area.

Most of these areas in the Silurian Valley area are associated with mining activity or roadside construction activities along State Highway 127. These occur in isolated areas south of Owlshead Mountains, west of State Highway 127, on the eastern side of the Avawatz Mountains, and east of Silver Lake.

South of the NTC, allscale is the most common species colonizing these disturbed areas. Salt cedar trees are found at several old well sites, mines, and human habitation sites. Disturbed areas associated with roads, dwellings, mines, powerlines, and OHV use were not mapped.

Lands cleared for agricultural use occur immediately southeast of Coyote Lake. Additional agricultural lands occur adjacent to the study area to the south and southeast of these lands. These agricultural areas have irrigation systems in place, although some of the areas do not appear to have been farmed recently.

3.5.2 Sensitive Plants

3.5.2.1 General

No listed Federal or State Threatened or Endangered Species would be expected to occur in the Silurian Valley north and east of the study area. Some potential exists for Federal Species of Concern (FSOC) and species considered rare or declining by the CNPS. Table 3.5-2 lists the species considered during the surveys. The federal, state, and CNPS status of each plant species is shown in the table. According to the February 28, 1996 Federal Register (50 CFR Part 17), many species that were previously considered candidates for listing have been removed from candidate status. Table 3.5-2 provides the new designation for these species, which is FSOC.

A field survey in the areas south, southeast, and southwest of the NTC for sensitive plants was conducted by the USFWS in 1988. Because of the large study area size, a comprehensive examination of all areas was not possible. Since completion of the 1988 biological surveys, additional land areas have been included in the project description as a result of project alternative reformulation. Additional studies to determine the locations of sensitive plant species within those portions of the study area not originally surveyed and areas surveyed but warranting further effort took place in the spring of 1989 and were completed in August 1989. Because of drought conditions, presence or absence could not be determined conclusively for many of the species not found in the survey.

The Michael Brandman Associates (MBA 1989) report included recommendations for additional studies in a year with near normal or more rainfall. Subsequent to the MBA (1989) studies, the USFWS updated the list of sensitive plant species potentially occurring in the study area with one additional species, the Tecopa bird's beak (*Cordylanthus tecopensis*). Tecopa bird's beak (FSOC), which is a fall flowering species, has been searched for and not detected in the study area. Surveys conducted as part of this project at previously recorded locations for the species indicate that the only extant population of the species in the region as a whole is confined to Tecopa Hot Springs, which is located approximately 13 miles north of the study area. No additional sensitive plant surveys were conducted in the spring of 1990 because of continued drought. The USFWS conducted a survey for Tecopa bird's beak in the fall of 1990 (USFWS 1991a). Rainfall in the spring of 1991 was near normal, and USFWS conducted additional, selective sensitive plant species surveys in the spring of 1991 (USFWS 1991b).

Seven sensitive plant species were located within the area south of the NTC: Lane Mountain milkvetch (*Astragalus jaegerianus*), alkali mariposa lily (*Calochortus striatus*), crucifixion thorn (*Castela emoryi*), Barstow woolly sunflower (*Eriophyllum mohavense*), Parish's phacelia (*Phacelia parishii*), Mojave indigobush (*Psorothamnus arborescens* var. *arborescens*), and Mojave fish-hook cactus (*Sclerocactus polyancistrus*). The locations of these species are shown on the plant sensitivity map (Figure 3.5-2).

The Lane Mountain milkvetch, a species proposed for listing as endangered by the USFWS in 1992, has been documented on the north side of the Paradise Range between NTC and the Goldstone area (Lee and Ro 1986). The comment period was reopened in the fall of 1996 to address the proposed listing of this species. The USFWS expects to make a decision on whether to list this species in the spring of 1997. During the 1989 surveys, two populations were discovered in the Goldstone area. Historic (1939-1941) Lane Mountain milkvetch population sites could not be determined precisely because of very generalized location data. Both of the 1989 populations are within a 5-mile radius of the estimated locations of two of the historic populations, and one or both of the new populations may refer to the historic populations. One new population (three plants) was found extending approximately 3 miles from the western boundary of the NTC and appeared to be contiguous with the Fort Irwin population. The second population (12 plants) was found approximately 1 mile southwest of the previously mentioned population and ranges in a north-south direction. A considerable amount of the habitat west and southwest of the Goldstone area appears suitable for the Lane Mountain milkvetch, but it was not found in this area during the 1989 surveys. Because of the dry winter, some plants may have had minimal growth and may not have been visible above ground in the spring of 1989. The Goldstone and Lane Mountain areas and the contiguous area on the NTC include the entire known existing and historic ranges of the species.

A small number of alkali mariposa lilies (FSOC) were previously reported growing among saltgrass in the upper reaches of the Paradise Spring area (Lee and Ro 1986). In May 1989, Bagley found a population of approximately 1,500 alkali mariposa lilies in the previously reported location on an open playa at

Table 3.5-2

SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA AND SURVEY RESULTS

Family/Scientific Name/Common Name	Status	Life Form/Flowering Period/Habitat Preferences/ Known Range/Elevation Range/Identification Information	Survey Results/Source
APIACEAE *Cymopterus deserticola* Desert cymopterus	FED: FSOC* ST: none CNPS: 1B	Perennial herb; flowering: March-May; microhabitat: fine to coarse, well-drained sandy soils of flats in dune areas; habitat: Joshua Tree woodland and Mojave Desert scrub; known range: east of Victorville to Muroc and Kramer; elevation: ± 1,500 m (2,300-2,900 ft.). Flowers required for species identification.	Species was not observed (probably due to lack of rainfall)$_1$
APIACEAE *Cymopterus gilmanii* Gilman's cymopterus	FED: CEQA ST: CEQA CNPS: 2	Perennial herb; flowering: April-May; microhabitat: rocky or gravelly slopes, desert canyons, rock ledges or cliffs, often on gypsum or limestone; habitat: Mojave Desert scrub; known range: Inyo Co. from Last Chance Mtns. to Death Valley and into Nevada; elevation: 1,000-2,000 m (3,300-6,500 ft.). Flowers required for species identification.	Species was not observed$_2$
ASCLEPIDACEAE *Cynanchum utahense* Utah vine milkweed	FED: CEQA? ST: CEQA? CNPS: 4	Perennial herb; flowering; April-June; microhabitat: dry, sandy, or gravelly areas; habitat: Mojave Desert scrub and Sonoran Desert scrub; known range: Deserts to Utah and Arizona; elevation: < 1,000 m. Identifiable in vegetative state.	One population observed at lava outcrop designated "the whale"$_{3,4}$
ASTERACEAE *Enceliopsis nudicaulis* Naked-stemmed daisy	FED: CEQA? ST: CEQA? CNPS: 4	Perennial herb; flowering: May; microhabitat: clayey soil, sand, or gravel, on stony slopes and ridges and in canyons, on volcanic or carbonates; habitat: Great Basin scrub, Mojave Desert scrub; known range: Death Valley area, Inyo Co. to Utah and Idaho; elevation: 950-2,000 m (< 6,000 ft.). Leaves required for species identification.	Species was not observed$_2$
ASTERACEAE *Eriophyllum mohavense* Barstow woolly sunflower	FED: FSOC* ST: none CNPS: 1B	Woolly, dwarfed, annual herb; flowering: April-May; microhabitat: open sandy or silty areas with spiny saltbush or creosote bush scrub; habitat: chenopod scrub, Mojave Desert scrub, and playas; known range: Barstow area, Mojave Desert, San Bernardino Co.; elevation: 500/800 m (2,000/3,000 ft.). Flowers required for species identification.	Species was located by USFWS on the east side of Copper City Road, west of Lane Mtn. southwest of the NTC$_1$
ASTERACEAE *Tetradymia argyraea* Striped horsebrush	FED: CEQA? ST: CEQA? CNPS: 4	Deciduous shrub; flowering: August-September; microhabitat: dry, rocky slopes; habitat: pinyon-juniper woodland; known range: Kingston and Clark Mtns., east Mojave Desert into Arizona; elevation: 1,400/2,100 m (< 7,000 ft.). Fruits required for species identification.	Species located east of the NTC scattered in the Avawatz Mtns., but exact location was not noted because plant did not have sensitive status at the time of the survey$_3$
BORAGINACEAE *Cryptantha holoptera* Winged cryptantha	FED: CEQA? ST: CEQA? CNPS: 4	Annual herb; flowering: March-April; microhabitat: sandy to rocky soils; habitat: Sonoran Desert scrub and Mojave Desert scrub; known range: Colorado and east Mojave Desert (scattered), into Arizona; elevation: 100-1,200 m (< 2,000 ft.). Nutlets required for species identification.	Species was not observed$_3$
BORAGINACEAE *Cryptantha tumulosa* New York Mtns. cryptantha	FED: FSOC ST: none CNPS: 4 Nevada: watch list	Perennial herb; flowering: April-June; microhabitat: dry places, gravel or clay, granitic or limestone soils; habitat: Mojave Desert scrub and pinyon-juniper woodland; known range: Providence Mtns., Mid Hills, New York Mtns., Ivanpah Mtns., Inyo and San Bernardino Cos., to Spring Mtns. in south Nevada; elevation: 1,400-2,100 m (< 6,000 ft.). Nutlets required for species identification.	Species located on limestone ridges near springs in Avawatz Mtns, east of the NTC$_3$

Table 3.5-2

SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA AND SURVEY RESULTS

Family/Scientific Name/Common Name	Status	Life Form/Flowering Period/Habitat Preferences/ Known Range/Elevation Range/Identification Information	Survey Results/Source
BRASSICACEAE *Draba californica* California draba	FED: CEQA? ST: CEQA? CNPS: 4	Small perennial herb; flowering: July-August; microhabitat: open, rocky areas, moist sandy soils; habitat: pinyon-juniper woodland, meadows and alpine boulder and rock fields; known range: New York Mtns., Panamint Mtns. in east Mojave Desert, White Mtns., Mono Co., to Texas; elevation: >3,000 m (5,000-6,000 ft.). May be identifiable in vegetative state but flowers preferable.	Species located east of the NTC in hills and fans in Mojave creosote bush scrub and in Mojave mixed woody scrub, but exact location was not noted because plant did not have sensitive status at the time of the survey[3]
CACTACEAE *Sclerocactus polyanciatus* Mojave fish-hook cactus	FED: FSOC ST: none CNPS: 1B	Stem succulent shrub; flowering: April-June; microhabitat: gravelly mesas, slopes, and canyons, on limestone; habitat: Joshua Tree woodland and Mojave Desert scrub; known range: Red Rock Canyon, Inyo Co. east to Nevada; elevation: 750-2,100 m (2,500-6,500 ft.). Flower required for genus identification.	Species located southwest of the NTC[1]
CRASSULACEAE *Dudleya saxosa* ssp. *saxosa* Panamint dudleya	FED: FSOC ST: none CNPS: 4	Perennial herb; flowering: April-September; microhabitat: dry, north-facing granitic or limestone slopes; habitat: Mojave Desert scrub and Joshua Tree woodland; known range: west Panamint Mtns., Inyo Co.; elevation: 1,100-2,200 m (3,000-7,000 ft.). Flowers required for species identification.	Species was not observed[1]
FABACEAE *Astragalus jaegerianus* Lane Mtn. milkvetch	FED: PE ST: none CNPS: 1B	Perennial herb; flowering: April-June; microhabitat: low, dry, stony hillsides and desert mesas, in granitic sand or gravel, commonly with Joshua trees, and usually under shrubs; habitat: Joshua Tree woodland and Mojave Desert scrub; known range: central Mojave Desert near Barstow; elevation: 900-1,200 m (3,000-3,800 ft.). Flowers required for species identification.	Species located southwest of the NTC[1]
FABACEAE *Astragalus lentiginosus* var. *borreganus* Borrego milkvetch	FED: CEQA? ST: CEQA? CNPS: 4	Annual herb; flowering: February-May; microhabitat: dunes and sandy valleys; habitat: Sonoran Desert scrub and Mojave Desert scrub; known range: east Colorado and Mojave Deserts to Arizona and northwest Mexico; elevation: 30-250 m (< 1,000 ft.). Flowers required for species identification.	Species was not observed[1]
FABACEAE *Astragalus nutans* Providence Mtns. milkvetch	FED: CEQA? ST: CEQA? CNPS: 4	Annual herb; flowering: March-June; microhabitat: sandy to rocky washes, canyon bottoms, and foothill slopes; habitat: Sonoran Desert scrub, Mojave Desert scrub, Joshua Tree woodland, and pinyon and juniper woodland; known range: east Mojave and north Colorado Deserts; elevation: 450-1,950 m (1,500-6,500 ft.). Flowers required for species identification.	Species was not observed[1]
FABACEAE *Lupinus magificus* var. *glarecola* Coso Mtns. lupine	FED: CEQA? ST: CEQA? CNPS: 4	Perennial herb; flowering: April-June; microhabitat: desert slopes and gravelly banks, in granitic soils, a fire-following species; habitat: Great Basin scrub; known range: Coso Mtns., Inyo Co.; elevation: 1,500-2,500 m (< 7,500 ft.). Flowers required for species identification.	Four populations located on steep slopes in Avawatz Mtns.[3] Two populations observed in upper elevations of the Avawatz Mtns[3, 4]

Table 3.5-2

SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA AND SURVEY RESULTS

Family/Scientific Name/Common Name	Status	Life Form/Flowering Period/Habitat Preferences/ Known Range/Elevation Range/Identification Information	Survey Results/Source
FABACEAE *Psorothamnus arborescens* var. *arborescens* (=*Dalea fremontii* var. *saundersii*) Mojave indigobush	FED: FSOC ST: none CNPS: 4	Deciduous shrub; flowering: April-May; microhabitat: sandy alluvial fans and washes, hillsides and stony flats on granitic bedrock; habitat: riparian scrub, Mojave Desert scrub; known range: north and west Victorville area to White Mtns., Kern and San Bernardino Co.; elevation: 400-800 m (1,300-2,600 ft.). Fruit required for species identification.	Species located southwest of NTC$_1$
HYDROPHYLLACEAE *Phacelia mustelina* Death Valley round-leaved phacelia	FED: FSOC ST: none CNPS: 1B Nevada: watch list	Short-lived annual herb; flowering: May-July; microhabitat: in crevices on the face of limestone cliffs, on volcanic outcrops, and in gravel talus; habitat: Mojave Desert scrub and pinyon-juniper woodland; known range: Mtns. in Death Valley to west Nevada; elevation: 1,000-2,100 m (3,000-6,000 ft.). Flowers required for species identification.	Though suitable habitat exists, species was not observed south of the NTC$_1$
HYDROPHYLLACEAE *Phacelia parishii* Parish's phacelia	FED: FSOC ST: none CNPS: 2	Branched annual herb; flowering: April-July; microhabitat: clay or alkaline soils, flats, slopes, and dry lake margins; habitat: Mojave Desert scrub, Joshua Tree woodland, and playas; known range: Mojave Desert from east Victorville, sw San Bernardino Co., and into Nevada; elevation: 800-1,200 m (2,000-6,000 ft.). Flowers required for species identification.	Species located south of the NTC$_1$
LILIACEAE (=AMARYLLIDACEAE-Munz) *Androstephium breviflorum* Small-flowered androstephium	FED: FSOC ST: none CNPS: 1B	Perennial herb; flowering: March-April; microhabitat: open areas and bajadas, dry loose sandy to rocky soil; habitat: Mojave Desert scrub; known range: deserts east of Inyo Co. and San Bernardino Co. to out of state; elevation: 550-2,295 m (1,800-7,550 ft.). Flower required for genus identification. Note: vegetation dies out by late spring.	Species was not observed (probably due to lack of rainfall)$_{1, 2}$ Species was located in low hills of the south Silurian Valley, west of Highway 127$_3$ Populations observed in Valjean Hills, north extent of the Soda Mountains, and east side of Red Pass Mountain$_{3, 4}$
LILIACEAE *Calochortus striatus* Alkali mariposa lily	FED: FSOC ST: none CNPS: 1B Nevada: watch list	Perennial herb from bulb; flowering: April-June; microhabitat: alkaline meadows, springy areas, and ephemeral washes; habitat: chenopod scrub, alkaline meadows, creosote bush scrub, and chaparral; known range: Mojave Desert at base of San Bernardino Mtns. and San Gabriel Mtns. Kern Co. to Las Vegas, Nev.; elevation: 800-1,400 m (2,500-4,500 ft.). Flowers required for species identification.	Species located southwest of the NTC near the Paradise range$_{1, 2}$
LOASACEAE *Petalonyx thurberi* ssp. *gilmanii* Death Valley sandpaper-plant	FED: FSOC ST: none CNPS: 1B	Evergreen shrub; flowering: May-September; microhabitat: sandy washes, canyons, dunes, and slopes; habitat: Desert dunes and Mojave Desert scrub; known range: restricted to Inyo Co.; elevation: < 1,200 m (1,500-5,000 ft.). Identifiable in vegetative state by leaves and life form.	Species was not observed (study area is out of the species' known range)$_2$
PAPAVERACEAE *Arctomecon merriamii* White bear poppy	FED: FSOC ST: none CNPS: 1B Nevada: watch list	Perennial herb; flowering: April-May; microhabitat: loose rocky slopes and flats, in gypsum, limestone and dolomite; habitat: chenopod scrub and Mojave Desert scrub; known range: Death Valley region to Clark Co., Nevada; elevation: 900-1,400 m (3000-4,600 ft.). Identifiable in vegetative state by leaves and life form.	One population observed on the eastern boundary of the project site in the Silurian Hills in Owl Canyon$_{3, 4}$

Table 3.5-2

SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA AND SURVEY RESULTS

Family/Scientific Name/Common Name	Status	Life Form/Flowering Period/Habitat Preferences/ Known Range/Elevation Range/Identification Information	Survey Results/Source
POACEAE *Achnatherum aridum* (=*Stipa arida*) Mormon needle grass	FED: CEQA ST: CEQA CNPS: 2	Tufted perennial herb; flowering: May-July; microhabitat: dry, limestone slopes, ridges, and rocky outcrops; habitat: Mojave Desert scrub, Great Basin scrub, Joshua Tree woodland and pinyon-juniper woodland; known range: Funeral Mtns. and Clark Mtn., east Mojave Desert to Colorado, Arizona, and Texas; elevation: 1,200-1,550 m (4,000-5,700 ft.). Flowers required for species identification.	Species was not observed$_2$
POACEAE *Bouteloua trifida* Red grama grass	FED: CEQA ST: CEQA CNPS: 2	Tufted perennial herb; flowering: May-September; microhabitat: dry, rocky, often calcareous slopes and crevices; habitat: Mojave Desert scrub and pinyon-juniper woodland; known range: Providence Mtns. and Death Valley region to Texas, Utah, and c. Mexico; elevation: 700-2,000 m (> 2300 ft.). Flowers required for species identification.	Species was not observed$_2$
POACEAE *Piptatherum micranthum* (=*Oryzopsis micrantha*) Small-flowered rice-grass	FED: CEQA ST: CEQA CNPS: 2	Densely tufted perennial herb; flowering: June-September; microhabitat: dry limestone crevices, gravel benches, rocky slopes, and creek banks; habitat: pinyon-juniper woodland; known range: Clark, Kingston, and White Mtns., east Mojave Desert to Canada and Rocky Mtns.; elevation: 700-2,950 m (6,000-8,800 ft.). Flowers required for species identification.	Species was not observed$_2$
POLEMONIACEAE *Linanthus arenicola* Sand linanthus	FED: FSOC ST: none CNPS: 2	Small annual herb; flowering: March-April; microhabitat: loose sandy to fine gravelly soils, at least some gypsum, on dunes, saline flats, or wash edges, often in Larrea-Atriplex association; habitat: Mojave Desert scrub, desert dunes, and Joshua Tree woodland; known range: Mojave Desert (Barstow, Kelso, Daggett, Searles Lake, Needles, Trona, etc.) and Nipton, Nevada; elevation: 800-1,400 m (2,500-4,000 ft.). Flowers required for species identification.	Species was not observed(probably due to lack of rainfall)$_{1, 2}$ Nine populations were located in the "stringer" washes on the bajadas east of NTC$_3$ Twenty-seven populations observed$_{3, 4}$
POLYGONACEAE *Chorizanthe spinosa* Mojave spineflower	FED: FSOC ST: none CNPS: 4	Low annual herb; flowering: April-July; microhabitat: sandy to gravelly areas; habitat: Mojave Desert scrub and chenopod scrub; known range: west Mojave Desert, east to Rabbit Springs; elevation: 6-1,300 m (> 3,500 ft.). Flowers required for species identification.	Species was not observed (study area is probably too far from the known range of the species)$_1$
SCROPHULARIACEAE *Castilleja plagiotoma* Mojave indian paintbrush	FED: CEQA? ST: CEQA? CNPS: 4	Hemiparasitic perennial herb; flowering: April-June; microhabitat: dry flats and ridges; habitat: Great Basin alluvial scrub and pinyon-juniper woodland; known range: base of San Gabriel and San Bernardino Mtns to Piute Mtns, and San Luis Obispo; elevation: 300-2,500 m (< 7,500 ft.). Flowers required for species identification.	Species was not observed (study area is probably too far from the known range of the species)$_1$
SCROPHULARIACEAE *Cordylanthus tecopnesis* Tecopa bird's-beak	FED: FSOC ST: none CNPS: 1B Nevada: Threatened	Branched, hemiparasitic annual herb; flowering: July-October; microhabitat: alkaline marsh and meadows with high groundwater, with moist to wet soils; habitat: Mojave Desert scrub, meadows, marshes and swamps; known range: Tecopa Hot Springs, Sarasota Springs, etc. in Inyo Co. and Nye Co., Nevada; elevation: 100-900 m (< 2,500 ft.). Flowers required for species identification.	Species was not observed (the study area is out of the known range of the species)$_{1, 2}$

Table 3.5-2

SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA AND SURVEY RESULTS

Family/Scientific Name/Common Name	Status	Life Form/Flowering Period/Habitat Preferences/ Known Range/Elevation Range/Identification Information	Survey Results/Source
SCROPHULARIACEAE *Mimulus mohavensis* Mojave monkeyflower	FED: FSOC ST: none CNPS: 1B	Small annual herb; flowering: April-June; microhabitat: dry, sandy or rocky washes along the Mojave River, often seen nestled between or against rocks; habitat: Mojave Desert scrub and Joshua Tree woodland; known range: Mojave Desert in Barstow-Victorville-Ord Mtn. region, San Bernardino Co.; elevation: 600-1,000 m (< 3,000 ft.). Flowers required for species identification and spotting in field.	Species was not observed (probably due to lack of rainfall)[1]
SCROPHULARIACEAE *Penstemon albomarginatus* White-margined beardtongue	FED: FSOC ST: none CNPS: 1B Nevada: Threatened	Perennial herb; flowering: March-May; microhabitat: deep, stabilized desert sand, in washes, along roadsides, and on stabilized dunes; habitat: desert dunes and Mojave Desert scrub; known range: near Lavic, south Mojave Desert to south Nevada and west Arizona; elevation: 700-900 m (1,800 ft.). Flowers required for species identification.	Species was not observed[2]
SCROPHULARIACEAE *Penstemon calcareus* Limestone beardtongue	FED: FSOC ST: none CNPS: 2	Perennial herb, flowering: April-May; microhabitat: dry crevices in limestone, dry canyon sides, and rocky slopes; habitat: Mojave Desert scrub, Joshua Tree woodland, and pinyon-juniper woodland; known range: Providence, Last Chance, and Grapevine Mtns; elevation: 1,200-1,600 m (< 6,000 ft.). Flowers required for species identification.	Species was not observed[1, 2]
SCROPHULARIACEAE *Penstemon stephensii* Stephen's beardtongue	FED: FSOC ST: none CNPS: 1B	Perennial herb; flowering: April-June; microhabitat: dry granitic, dolomitic or limestone rocky slopes, cliffs, crevices, and washes; habitat: Mojave Desert scrub and pinyon-juniper woodland; known range: Kingston and Providence Mtns, San Bernardino Co. and Inyo Co.; elevation: 1,200-1,500 m (< 7,200 ft.). Flowers required for species identification.	Species was not observed[1, 2]
SIMAROUBACEAE *Castela emoryi* Crucifixion thorn	FED: CEQA ST: CEQA CNPS: 2 BLM: Protected	Spiny deciduous shrub or small tree; flowering: June-July; microhabitat: dry, gravelly washes, slopes, and plains; habitat: Sonoran Desert scrub and Mojave Desert scrub; known range: Mojave Desert (Daggett, Ludlow, Amboy, Goffs) and Colorado Desert (Hayfields, Coyote Wells) to Arizona and northwest Mexico; elevation: ± 650 m (2,132 ft.). Identifiable in vegetative state.	Species located southwest of the NTC, near Dunn Road[1]

Table 3.5-2

SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA AND SURVEY RESULTS

Family/Scientific Name/Common Name	Status	Life Form/Flowering Period/Habitat Preferences/ Known Range/Elevation Range/Identification Information	Survey Results/Source

STATUS CODES

Federal (FED)

- **FE** = Federally listed, endangered
- **FT** = Federally listed, threatened
- **PE** = Federally proposed, endangered
- **PT** = Federally-proposed, threatened
- **FSOC** = Federal Species of Concern - Former Federal Candidate Species
- ***** = Concern for these species remains high and their status will be reevaluated based on available information about protection by the West Mojave Coordinated Management Plan.

State (ST)

- **CE** = State-listed, endangered
- **CT** = State-listed, threatened
- **CR** = State-listed, rare
- **none** = To date, species has not been afforded any official status

Additional Federal/State Codes

- **CEQA?** = Plant has no federal or state legal standing but is recommended by CNPS for evaluation for CEQA consideration.
- **CEQA** = Plant has no federal or state legal standing but CEQA consideration is mandatory.

CNPS

- **1A** = Plants Presumed Extinct in California - All plants meet definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endagered Species Act) and are eligible for state listing. CEQA consideration is mandatory.
- **1B** = Plants Rare, Threatened, or Endangered in California and Elsewhere - Plants meet definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endagered Species Act) and are eligible for state listing. CEQA consideration is mandatory.
- **2** = Plants Rare, Threatened, or Endangered in California but More Common Elsewhere - Plants are not eligible for federal consideration under the provisions of the Endangered Species Act. Plants meet definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endagered Species Act) and are eligible for state listing. CEQA consideration is mandatory.
- **3** = Plant for which More Information is Needed; a Review List - Plants are taxonomically problematic. Some species meet definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endagered Species Act) and are eligible for state listing. CEQA consideration is being recommended by CNPS.
- **4** = Plants of Limited Distribution; a Watch List - CEQA consideration is being recommended by CNPS.

Databases Searched

California Natural Diversity Data Base (CNDDB), USGS 7.5-minute quadrangles searched (1994); California Native Plant Society's Electronic Inventory (CNPSEI), USGS 7.5-minute quadrangles searched (1994); Quads searched in both databases: Avawatz Pass, Dumont Dunes, East of Owl Lake, North of Baker, Old Ibex Pass, Owl Lake, Red Pass Lake NE, Saddle Peak Hills, Sheep Creek Spring, Silurian Hills, Silurian Lake, Silurian Valley, Valjean Hills, and West of Baker; Scientific nomenclature as per Hickman, 1993; Range information as per Munz, 1973, Hickman, 1993, and CNPSEI 1994; Flowering period, microhabitat, habitat, and elevations as per CNPSEI 1994; CNDDB 1994; Hickman 1993; and Munz 1974.

Sources

[1] MBA 1989
[2] Chambers Group Inc. 1992
[3] Bagley 1994
[4] Chambers Group 1995

Paradise Spring and an additional small population of only two individuals in a seep within a canyon approximately 0.7 mile north of the Paradise Spring population. Other springs in the study area did not appear to have suitable habitat for this species.

The crucifixion thorn occurs within the study area in dense scrubland at the edge of a small dry lake north of the Afton Canyon exit from I-15. This woodland of crucifixion thorn covers approximately 99 acres and was not found elsewhere in the study area. No additional suitable habitat in the study area was found. The area containing crucifixion thorn has been designated as an UPA by the BLM and is currently protected.

The Barstow woolly sunflower (FSOC) was found in the 1991 USFWS spring survey on Coolgardie Mesa west of Lane Mountain. This population was located approximately 15 miles north of Barstow on the east side of the a road that joins Copper City Road. At the time of the survey, this population consisted of approximately 64 plants and represented an eastward extension of the known range of the species. At an elevation of 3,600 feet, the population is also approximately 700 feet higher than previously reported populations. The Barstow woolly sunflower was not found in the 1989 surveys, possibly because of drought conditions. The USFWS notes that, in subsequent visits to this area, several thousand individuals were seen and then in a 1994 USFWS survey, far fewer than 64 individuals were seen at this location (USFWS, comments), indicating the population size has been greatly affected by environmental conditions. In that year, the Barstow woolly sunflower was not observed in several of the known populations outside of the study area.

In May 1989, a population of Parish's phacelia (FSOC) estimated at several thousand plants and occupying approximately 5 acres was discovered on a playa just north of the southern boundary of the study area, approximately 5 miles southeast of Coyote Lake. When observed during the USFWS 1991 studies, the range of Parish's phacelia extended to small playas northwest and southeast of the 1991 study range. Prior to the discovery of the species during the 1989 survey, the Parish's phacelia was believed to be extinct in California. To date this population remains the only known population within the state.

The Mojave indigobush (FSOC) was found during the 1988 surveys in a sandy wash northeast of Coyote Dry Lake near the Fort Irwin boundary. It also occurs in the southwestern portion of the NTC-Goldstone area and the central portion of the NTC (Lee and Ro 1986). During surveys conducted in the spring of 1989, 11 new populations were discovered in washes throughout the western half of the study area. Several of the populations numbered over 1,000 individuals.

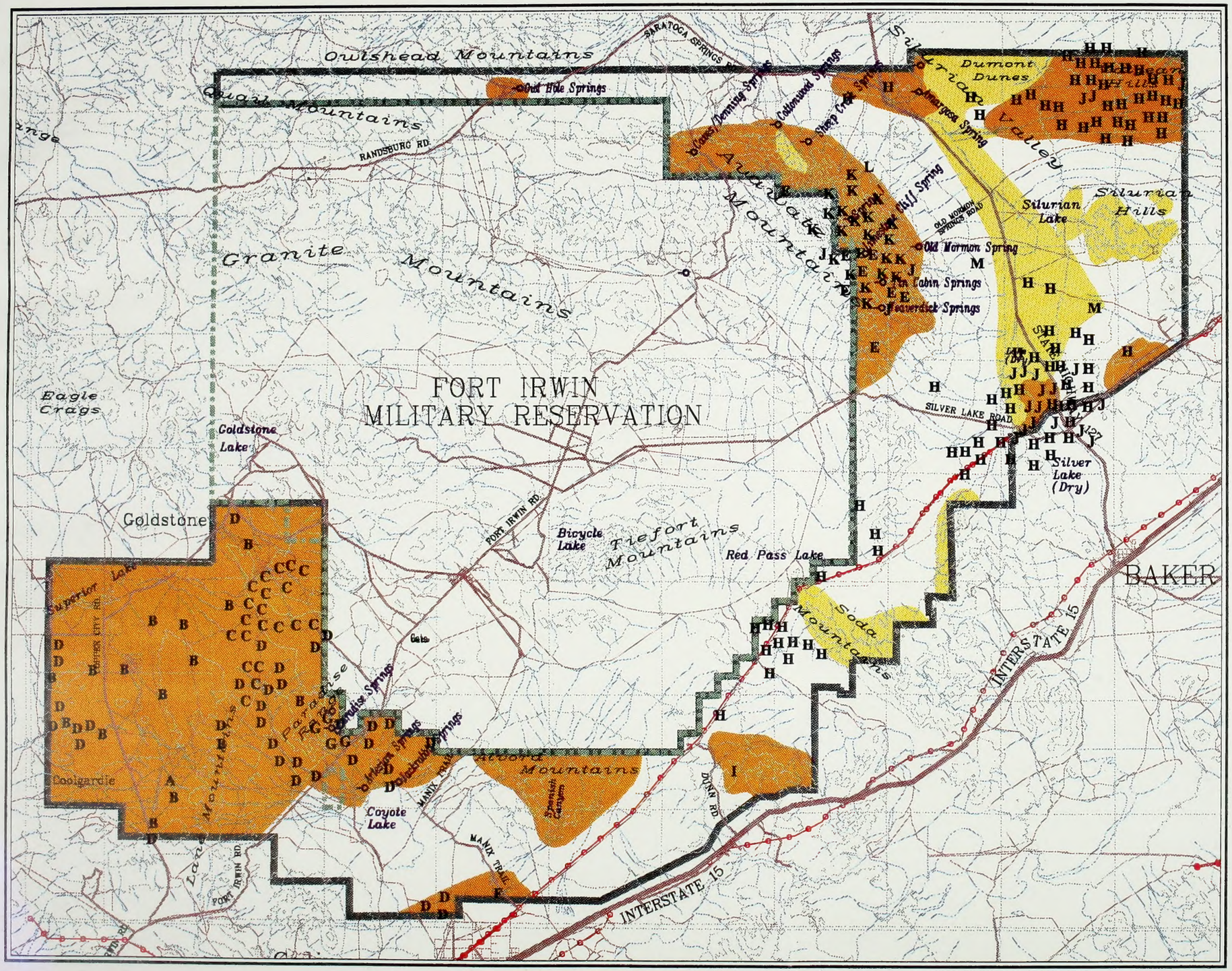
The Mojave fish-hook cactus (FSOC) is found within the Goldstone area on gravelly slopes and mesas in creosote bush scrub. During the spring 1989 surveys, 16 populations (including previously reported populations) of Mojave fish-hook cactus were located throughout the Goldstone area and the western half of the study area. Population sizes ranged from one to six individuals, including some populations that consisted partly or entirely of dead individuals. Twenty-six living plants were found in these surveys.

The spring 1993 rare plant survey of the Silurian Valley revealed six sensitive plant species on the Silurian Valley site (Bagley 1994). One small-flowered androstephium plant (*Androstephium breviflorum*) (FSOC) was located in the low hills on the southern border of Silurian Valley (Figure 3.5-2). The species was located approximately 0.6 mile north-northwest of the northern end of Silyer Lake and approximately 1,000 feet west of Highway 127.

Nine populations of sand linanthus (*Linanthus arenicola*) (FSOC) were located in sandy "stringer" washes on the bajadas of Silurian Valley and north of the Avawatz Mountains. One population (consisting of two patches with a combined total of approximately 17 individuals) was located in the northwestern portion of the study site in the Armagosa River floodplain, about 1.8 miles west of Highway 127 along Saratoga Springs Road, near the junction with Sheep Creek Spring Road. One patch was located approximately 300 m north of the junction with the second patch located 100 m southwest of the junction.

A second population of six individuals was located approximately 28 miles north of Baker at the edge of a dune on the northeast slope of the Valjean Hills.

The third and fourth populations were located in the northeast portion of the Silurian Valley. The third population of fewer than 10 individuals was located approximately 3.1 miles north of Valjean, 1.3 miles north of Kingston Wash, and just west of the old railroad grade. The population was situated on the upper bajada slope. The fourth population (of less



Explanation

- Areas of High Plant Sensitivity
- Areas of Moderate Plant Sensitivity
- Areas of Low Plant Sensitivity
- Springs
- Power/Transmission Lines

A. Eriophyllum mohavense
(Barstow woolly sunflower)
B. Schlerocactus polyancistrus
(Mojave fish-hook cactus)
C. Astragalus jaegerianus
(Lane Mountain milkvetch)
D. Psorothamnus arborenscens
var. arborescens
(Mojave indigobush)
E. Cryptantha tumulosa
(New York Mtns. cryptantha)
F. Phacelia parishii
(Parish's phacelia)
G. Calocortus striatus
(Alkali mariposa lily)
H. Linanthus arenicola
(Sand linanthus)
I. Castela emoryi
(Crucifixion thorn)
J. Androstephium brevifolium
(Small-leaved androstephium)
K. Lupinus magnificus
var. glaucola
(Coso Mtns. lupine)
L. Tetradymia argyraea
(Striped horsebrush)
(General vicinity)
M. Draba californica
(California draba)
(Not mapped but located
in general area)
N. Arctomecon merriamii
(Bear poppy)

Entire Study Area
VEGETATION
SENSITIVE AREAS
Figure 3.5-2

Chambers Group, Inc.
5 2.5 1.25 0 5 Miles
1" = 30000'
Project# 6347
December 03, 1996

December 03, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

than 50 individuals) was located at the edge of and in Kingston Wash, about 0.1 mile east and west of the old railroad grade.

A fifth population of one individual was located in a wash at the southeast end of the Silurian Valley, approximately 5 miles east-northeast of the northern end of Silver Lake and 0.7 mile north of the transmission lines.

Three populations were located in the alluvial washes at the southern end of the Silurian Valley. A population of 15 individuals was located approximately 11.6 miles north of Baker on Highway 127, approximately 200 to 500 feet east of the highway. A population of two small patches with a combined total of 26 individuals was located approximately 11 miles north of Baker on Highway 127 and about 1.5 miles north-northwest of the northern end of Silver Lake. Both patches occurred near a dirt road and were about ½ mile apart. A population of two patches with a combined total of 37 individuals was located 0.6 mile north of the northern end of Silver Lake, approximately 1/8 mile west of Highway 127. One patch was located on a hillside with the smaller patch located in a nearby wash.

The ninth population, consisting of close to 200 individuals, was located at the northern edge of the Soda Mountains, approximately 1.75 miles west-southwest of the northern end of Silver Lake and about 0.6 mile north of the transmission lines. The plants were located on bajada slopes, in sandy washes, and on hillsides within 20 to 30 acres.

Due to limiting time constraints and inaccessibility of terrain, bajadas were primarily investigated by spot checks. Based on the number of noted populations and the number of bajada spot checks, conclusions may be drawn that the bajadas of Silurian Valley and north of the Avawatz Mountains have potential to support many populations of sand linanthus.

Five populations of Coso Mountains lupine (*Lupinus magnificus* var. *glarecola*) were located in the Avawatz Mountains on steep rugged scree slopes. One population of 50 to 100 plants was located on the northeast side of the Avawatz Mountains on the east side of upper Anvil Canyon, about 4.4 miles west-northwest of old Mormon Spring. Three populations were located in an unnamed canyon just south of upper Anvil Canyon. One population of 50 to 70 plants was located in this canyon about 3.75 miles west-northwest of Old Mormon Spring, the second population of 15 to 25 plants was located in this canyon approximately 3.8 miles west-southwest of the spring, and the third population (consisting of three plants) was located in this canyon approximately 4 miles west-northwest of the spring. The fifth population (consisting of five plants) was located on the east side of the Avawatz Mountains, just east of Limestone Cliff Spring and about 2.9 miles west-northwest of Old Mormon Spring. These populations represent a range extension for this species, which is previously known only from the Coso and Argus ranges and in the eastern Sierra Nevada in the southern Owens Valley.

Two populations of New York Mountains cryptantha (*Cryptantha tumulosa*) (FSOC) were located on the upper slopes of the Avawatz Mountains. Both populations were observed on limestone ridges near springs, but because the plant's identification was made subsequent to the field survey, neither the size nor extent of the populations was determined at the time of the survey. One population was observed on a limestone ridge between Tin Cabin Spring and Weaverdick Spring, with the second population occurring north-northwest and south-southeast of Limestone Cliff Spring. It was noted that the plants were scattered, suggesting that the potential for other populations to occur in this area is high.

California draba (*Draba californica*) and striped horsebrush (*Tetradymia argyraea*) were noted by Bagley as occurring east of the NTC. At the time of the survey, neither species was considered sensitive so population information was not collected. However in 1994, both species were placed on the CNPS watch list as species believed to have limited distribution. In addition, both species are being recommended by the CNPS for evaluation for consideration under California Environmental Quality Act (CEQA). According to field notations made by Bagley (Chambers Group 1995), the California draba was observed on peaks, hills, and alluvial wash fans in the Mojave creosote bush scrub and in Mojave mixed woody scrub community. The striped horsebrush was noted in juniper scrub and blackbush scrub communities in the Avawatz Mountains.

3.5.2.2 Sensitivity Analysis

Areas of high, moderate, and low sensitivity with regard to plant species and habitat within the study area are delineated on a sensitivity potential map (Figure 3.5-2). Determination of an area's sensitivity status is based on the following factors: presence of

sensitive species, presence of potentially suitable habitat for sensitive species, regional abundance of habitat or community type, and level of habitat disturbance. The following criteria were used to determine potential sensitivity:

- Areas are considered to have high sensitivity potential if known sensitive plant species populations occur in the area, the area contains suitable habitat for 50 percent or more of the sensitive plant species with potential to occur in the project region, regional abundance of the species or community is low or on the decline, and/or level of disturbance of habitat is negligible or low.

- Areas are considered to have moderate sensitivity potential if the area contains suitable habitat for at least 50 percent of the sensitive plant species with potential to occur in the project region, regional abundance is moderate and/or on the decline, and/or the level of habitat disturbance is low to moderate.

- Areas are considered to have low sensitivity potential if no suitable habitat exists that has potential to support sensitive species, regional abundance of the habitat is high and common, and the level of habitat disturbance is high.

In the Silurian Valley area, many localities have potential to support sensitive plant species. A number of spring and riparian localities are present in the study area: Sheep Creek Spring, Cottonwood Spring, and four unnamed springs in Salt Creek east of the Salt Spring Hills and springs in the Avawatz Mountains (Figure 3.5-2). Active Dunes and stabilized or partially stabilized sand fields occur in portions of the Silurian Hills and Little Dumont Dunes or Ripple Dunes (at the northern border of the study area). Both riparian and dune areas are considered communities on the decline and are therefore considered to be highly sensitive. Dunes and sand fields are classified as rare communities by the CNDDB and would be considered sensitive by resource agencies.

Silurian Dry Lake, Dry Sands Lake, and the northern tip of the Hollow Hills are considered moderately sensitive because, although no sensitive plants were observed, disturbance in these areas is low and they contain considerable habitat that is suitable for sensitive species.

The remaining portions of the Silurian Valley are considered to have low sensitivity potential because of the lack of suitable habitat for sensitive species, no recorded occurrences of sensitive species in the area, and the regional abundance of the communities is high.

In the area south of the NTC, eight areas are designated as having high sensitivity potential. A crucifixion thorn woodland occurs southeast of the NTC. This community has been recognized by the BLM as a very sensitive UPA that reaches its range limit in the California Desert Conservation Area (BLM 1980). In addition, crucifixion thorn is placed on List 2 (plants rare or endangered in California but more common elsewhere) in the CNPS inventory of rare plants (Pavlik and Skinner 1994). Populations of sensitive plants also occur south of the Alvord Mountains (near the study area's boundaries), west of the Alvord Mountains (on the NTC southwest border), in the Lane Mountain area (on the southwestern boundary of the study area), and in the Goldstone area (in the northwestern corner of the southern area). Any expansion or disturbance of these areas would be detrimental to populations of species that are considered to be on the decline. Sensitive species also tend to be indicators of areas that have potential to harbor other known sensitive species or species that might gain sensitive status in the future but are unknown as yet. Two freshwater seeps occur on the northern edge of Coyote Lake. Although no sensitive species were observed in these seeps, desert riparian areas (such as seeps) are uncommon in this habitat and are considered sensitive because of the riparian species that occur and the wildlife habitat they provide.

The Alvord Mountains contain no observed sensitive species, but they are considered an area of moderate sensitivity because of the considerable numbers of desert willow that were mapped in this area, particularly on the eastern portion of the mountains. The desert willow can serve as an indicator species for watercourses that can harbor habitat for sensitive plant species and wildlife.

Although the remaining portions of the study area have relatively low disturbance, they are considered to have low sensitivity potential because of lack of habitat for sensitive species or the presence of any sensitive species or features.

3.5.3 Wildlife Resources

Several surveying techniques and procedures were used in previous studies of the study area. These include reconnaissance-level surveys, transects, and focused studies. Reference should be made to the supporting documents for specific details of each survey methodology.

An extensive literature review was conducted of previous work within the study area, and this literature serves as the baseline data for this document. The majority of the previous studies concentrated on two main portions of the study area: the southern portion, including both the Alvord Mountains and the westernmost part of the Soda Mountains; and the eastern portion that includes the Avawatz Mountains, Silurian and Valjean Hills, and the entire Silurian Valley.

Studies conducted in support of the land acquisition in areas south of the NTC include biological studies for the preliminary Draft EIS of the entire southern area (MBA 1991), a biological assessment of the area around the Soda Mountains and Silurian Valley (Chambers Group 1992d), and an extensive study of the desert tortoise (Chambers Group 1992e) along the northern slope of the Alvord Mountains.

The biological resources of the eastern portion of the study area were extensively studied in the fall of 1992 by Chambers Group. General wildlife studies of the Silurian Valley and vicinity, as well as a survey of desert tortoise populations in the area, were conducted in September and October 1992 (Chambers Group 1992c; 1992f, respectively).

Other literature sources referenced for pertinent ecological information include the Peterson field guides to mammals (Burt and Grossenheider 1976); amphibians and reptiles (Stebbins 1985); western birds (Peterson 1990); hawks, eagles, and falcons of North America (Johnsgard 1990); and California's Wildlife, Volumes I-III (CDFG Publication 1990). The CNDDB was also accessed for information on sensitive wildlife known to occur in the vicinity of the study area.

3.5.3.1 Wildlife Habitats

The study area consists primarily of creosote bush scrub habitat. Within the study area, distinct microhabitats (areas of a smaller scale that support a unique grouping of plant and animal species) also exist.

Watercourses in the study area (e.g., the Amargosa River, Salt Creek, and Sheep Creek Spring in the eastern portion and Jack Rabbit Spring to the south) are of major importance to wildlife. Because water resources are scarce, reliable surface water, such as springs, seeps, or creeks, provide high concentrations of foliage and cover that contribute to an increase in wildlife diversity in these areas. Permanent water sources onsite support certain fish and amphibian species, as well as birds, bats, and large mammals.

Areas of rocky terrain, such as the Avawatz Mountains to the east and the Alvord Mountains and Soda Mountains to the south, as well as other mountainous and hilly ranges onsite, provide suitable habitat for many reptile, rodent, and bird species. Within the project boundary, nine bat species that potentially occur would rely on rocky outcrops for roosting sites, such as the type found in the foothills of the Avawatz Mountains. Sensitive raptor species also use cliff faces and rocky ledges in mountain habitat as sites to roost or nest.

Three dune systems partially occur within the study area. Two areas occur along the northeastern border of the eastern portion of the study area and are extensions of the Little Dumont Dunes (northwest of Amargosa Spring) and the Valjean Dunes. The other area is found on the eastern side of the northern portion of the Soda Mountains. The extensive patches of fine, wind-blown sand support a variety of sand-dwelling animals, including fringe-toed lizards (highly adapted and specialized for life in sandy habitats), snakes, and small rodents.

Four dry lakes occur in the study area: Dry Sands Lake and Silurian Lake in the eastern portion of the site and Coyote Lake and Superior Dry Lakes to the south and southwest. These areas are essentially devoid of vegetation and would not support wildlife when dry. Animals, such as migratory birds and larger mammals, may visit these areas on occasion after heavy rains.

Washes and drainages occur throughout the study area. The three main washes in the eastern portion are the Kingston, Riggs, and Dry Sands Lake. Spanish Canyon in the southern portion of the study area is part of a large drainage system running out of the Alvord Mountains, and many drainages from the numerous springs in the area are in the west. These

areas generally have a higher vegetation density, and wildlife diversity is usually higher than the surrounding bajadas. Washes are often used by animals as movement corridors (areas of dense foliage that provide cover and protection against predators when moving between areas). Many animal tracks and other evidence of use by animals (e.g., fecal material and burrows) are usually observed along the sandy wash bottoms.

As is typical of most desert systems, larger animal species are uncommon, widely dispersed, and often nocturnal. Smaller mammals and reptiles, highly adapted to harsh desert conditions, are much more common, but are often either secretive, nocturnal, or active for only short periods of the year. Birds are among the most conspicuous species, usually occurring in greatest concentration in the vicinity of washes and springs where more structured and complex vegetative assemblages occur. With some exceptions, wildlife (such as birds and larger mammals) is generally mobile and not limited to a single habitat type. Therefore, it should be noted that the entire study area is likely used in the course of an organism's daily and seasonal activity patterns, particularly for larger and/or more mobile species. It should also be noted that some species onsite (e.g., fish, amphibians, and some reptilian and mammalian specialists for example) are highly adapted for one habitat type and are restricted to these specialized areas.

Although wildlife surveys typically do not focus on invertebrate species, invertebrates are an essential component of desert ecosystems, providing food for numerous vertebrate species and acting as pollinators for a large number of plant species. The seasonal reproductive cycle of some insect species results in an "explosion" of the population in a relatively short period of time. This "swarming" of individuals provides an important prey base for insectivores, such as smaller birds, reptiles, amphibians, and bats.

The following section summarizes the biological diversity of the study area. Each vertebrate taxonomic group is addressed. Table 3.5-3 (general wildlife) is a compilation of all wildlife observed in the study area during previous studies.

3.5.3.2 Wildlife Diversity

Invertebrates

Several invertebrate species, mostly insects, occur or are likely to occur within the study area. The orthopterans (crickets, grasshoppers, and others) are the most commonly observed insects. Also commonly observed were coleopterans (beetles) and hymenopterans (ants, wasps, and bees). The pallid-winged grasshopper (*Trimerotropis pallidipennis*) is the grasshopper most often observed in the study area. Three other Mojave Desert grasshoppers, the creosote bush grasshopper (*Bootettix argentatus*), desert clicker grasshopper (*Ligurotettix coquilletti*), and furnace heat lubber (*Tytthoytle maculata*), also occur within the study area, and all are associated with creosote bush. Darkling beetles are the abundant ground-dwelling beetle species within the study area. The two most common species are *Cryptoglossa verrucossa* and *Eleodes armata*. Ant species associated with several Mojave Desert vegetation types, including the California harvester ant (*Pogonomyrmex californicus*) and rough harvester ant (*Pogonomyrmex rugosus*), are also common within the study area.

Fishes

The Amargosa River and its tributaries (located in the eastern portion of the study area) are flowing for at least part of the year. Any permanent flow areas or permanent ponds along the Amargosa River would be considered adequate habitat to support desert fish species. The Amargosa pupfish (*Cyprinodon nevadensis amargosae*) and the Amargosa Canyon speckled dace (*Rhinichthys osculus* ssp.) are both known to occur in the Amargosa River and were observed during a reconnaissance survey conducted by Chambers Group biologists in April 1992 (Chambers Group 1992b). These species have also historically been known to occur in Salt Creek located in the eastern portion of the study area running parallel to State Highway 127. Although numerous active perennial springs are located in the study area, no documentation exists of fish species occurring in any of these springs.

Table 3.5-3

WILDLIFE SPECIES OBSERVED WITHIN THE STUDY AREA

Species	Common Name	Source
Amphibians		
Bufo punctatus	red-spotted toad	Chambers Group 1992c
Reptiles		
Xerobates(=Gopherus) agassizii	desert tortoise[1]	Chambers Group 1992f
Coleonyx variegatus	banded gecko	USFWS 1988
Dipsosaurus dorsalis	desert iquana	Chambers Group 1992c
Sauromalus obesus	chuckwalla[1]	USFWS 1988
Callisaurus draconoides	zebra-tailed lizard	Chambers Group 1992c
Uma scoparia	Mojave fringe-toed lizard[1] collared	Chambers Group 1992c
Crotaphytus collaris	lizard	Chambers Group 1992c
Gambelia wislizenii	long-nosed leopard lizard	Chambers Group 1992c
Sceloporus magister	desert spiny lizard	USFWS 1988
Sceloporus occidentalis	western fence lizard	Bagley et al. 1983
Uta stansburiana	side-blotched lizard	USFWS 1988
Urosaurus graciosus	long-tailed brush lizard	Chambers Group 1992c
Phrynosoma platyrhinos	desert horned lizard	Chambers Group 1992c
Cnemidophorus tigris	western whiptail	Chambers Group 1992c
Leptotyphlops humilis	western blind snake	MBA 1984
Phyllorhynchus decurtatus	spotted leaf-nosed snake	MBA 1984
Masticophis flagellum	coachwhip	Chambers Group 1992c
Salvadora hexalepis	western patch-nosed snake	USFWS 1988
Arizona elegans	glossy snake	MBA 1984
Pituophis melanoleucus	gopher snake	USFWS 1988
Lampropeltis getulus	common kingsnake	MBA 1984
Rhinocheilus lecontei	long-nosed snake	USFWS 1988
Chionactis occipitalis	western shovel-nosed snake	MBA 1984
Hypsiglena torquata	desert night snake	MBA 1984
Crotalus mitchelli	speckled rattlesnake	USFWS 1988
Crotalus cerastes	sidewinder	USFWS 1988
Crotalus scutulatus	Mojave rattlesnake	USFWS 1988
Birds		
Ardea herodias	great blue heron	Chambers Group 1992c
Charadrius vociferus	killdeer	USFWS 1988
Alectoris chukar	chukar	USFWS 1988
Callipepla gambelii	gambel's quail	USFWS 1988
Callipepla californica	California quail	Bagley et al. 1983
Circus cyaneus	northern harrier[1]	Chambers Group 1992c
Accipiter striatus	sharp-shinned hawk[1]	Chambers Group 1992c
Accipiter cooperii	Cooper's hawk[1]	MBA 1991
Aquila chrysaetos	red-tailed hawk	MBA 1991
Buteo jamaicensis	Swainson's hawk[1]	USFWS 1988
Buteo swainsoni	ferruginous hawk[1]	USFWS 1988
Buteo regalis	golden eagle[1]	Chambers Group 1992c
Cathartes aura	turkey vulture	Chambers Group 1992c
Falco sparverius	American kestrel	Chambers Group 1992c

Table 3.5-3

WILDLIFE SPECIES OBSERVED WITHIN THE STUDY AREA

Species	Common Name	Source
Birds (Continued)		
Falco mexicanus	prairie falcon[1]	Chambers Group 1992c
Tyto alba	common barn-owl	USFWS 1988
Asio flammeus	short-eared owl[1]	Chambers Group 1992c
Athene cunicularia	burrowing owl[1]	Chambers Group 1992c
Zenaida macroura	mourning dove	Chambers Group 1992c
Geococcyx californianus	greater roadrunner	Chambers Group 1992c
Chordeiles acutipennis	lesser nighthawk	USFWS 1988
Phalaenoptilus nuttallii	common poorwill	Chambers Group 1992c
Calypte costae	Costa's hummingbird	USFWS 1988
Colaptes auratus	northern flicker	Chambers Group 1992c
Picoides scalaris	ladder-backed woodpecker	Chambers Group 1992c
Melanerpes uropygialis	Gila woodpecker[1]	Chambers Group 1992c
Tyrannus verticalis	western kingbird	USFWS 1988
Myiarchus cinerascens	ash-throated flycatcher	Chambers Group 1992c
Contipus sordidulus	western wood-pewee	USFWS 1988
Sayornis saya	Say's phoebe	Chambers Group 1992c
Eremophila alpestris	horned lark[1]	Chambers Group 1992c
Aeronautes saxatalis	white-throated swift	USFWS 1988
Hirundo rustica	barn swallow	USFWS 1988
Corvus corax	common raven	Chambers Group 1992c
Auriparus flaviceps	verdin	Chambers Group 1992c
Thryomanes bewickii	Bewick's wren	Chambers Group 1992c
Salpinctes obsoletus	rock wren	Chambers Group 1992c
Campylorhynchus brunneicapillus	cactus wren	USFWS 1988
Regulus calendula	ruby-crowned kinglet	USFWS 1988
Polioptila caerulea	blue-gray gnatcatcher	USFWS 1988
Polioptila melanura	black-tailed gnatcatcher[1]	Chambers Group 1992c
Mimus polyglottos	northern mockingbird	USFWS 1988
Toxostoma lecontei	LeConte's thrasher[1]	Chambers Group 1992c
Catharus guttatus	hermit thrush	USFWS 1988
Lanius ludovicianus	loggerhead shrike[1]	Chambers Group 1992c
Bombycilla cedrorum	cedar waxwing	USFWS 1988
Phainopepla nitens	phainopepla	USFWS 1988
Vireo solitarius	solitary vireo	USFWS 1988
Vireo huttoni	Hutton's vireo	Chambers Group 1992c
Vireo gilvus	warbling vireo	USFWS 1988
Dendroica coronata	yellow-rumped warbler	Chambers Group 1992c
Dendroica petechia	yellow warbler[1]	MBA 1991
Vermivora celata	orange-crowned warbler	USFWS 1988
Geothylpis trichas	common yellowthroat	MBA 1984
Wilsonia pusilla	Wilson's warbler	USFWS 1988
Sturnella neglecta	western meadowlark	Chambers Group 1992c
Molothrus ater	brown-headed cowbird	USFWS 1988
Icterus galbula bullocki	northern oriole	Bagley et al. 1983
Piranga ludoviciana	western tanager	USFWS 1988
Zonotrichia leucophrys	white-crowned sparrow	Chambers Group 1992c
Amphispiza belli	sage sparrow	MBA 1984

Table 3.5-3

WILDLIFE SPECIES OBSERVED WITHIN THE STUDY AREA

Species	Common Name	Source
Birds (Continued)		
Amphispiza bilineata	black-throated sparrow	Chambers Group 1992c
Passerella iliaca	fox sparrow	Chambers Group 1992c
Pheucticus melanocephalus	black-headed grosbeak	USFWS 1988
Carpodacus mexicanus	house finch	USFWS 1988
Carduelis psaltria	lesser goldfinch	Chambers Group 1992c
Mammals		
Antrozous pallidus	pallid bat[1]	Chambers Group 1992c
Pipistrellus hesperus	western pipistrel	Chambers Group 1992c
Taxidea taxus	badger[1]	Chambers Group 1992c
Spilogale putorius	spotted skunk	MBA 1984
Canis latrans	coyote	Chambers Group 1992c
Vulpes macrotis	kit fox	Chambers Group 1992c
Lynx rufus	bobcat	MBA 1984
Ammospermophilus leucurus	whitetail antelope squirrel	Chambers Group 1992c
Spermophilus mohavensis	Mohave ground squirrel[1]	USFWS 1988
Thomomys bottae	Botta's pocket gopher	USFWS 1988
Perognathus formosus	long-tailed pocket mouse	USFWS 1988
Perognathus longimembris	little pocket mouse[1]	USFWS 1988
Perognathus parvus	Great Basin pocket mouse	USFWS 1988
Perognathus penicillatus	desert pocket mouse	USFWS 1988
Dipodomys deserti	desert kangaroo Rat	Chambers Group 1992c
Dipodomys merriami	Merriam's kangaroo rat	Chambers Group 1992c
Dipodomys microps	Great Basin kangaroo rat	USFWS 1988
Dipodomys panamintinus	Panamint kangaroo rat	USFWS 1988
Reithrodontomys megalotis	western harvest mouse	Bagley et al. 1983
Peromyscus crinitus	canyon mouse	USFWS 1988
Peromyscus maniculatus	deer mouse	USFWS 1988
Onychomys torridus	southern grasshopper mouse	USFWS 1988
Neotoma lepida	desert woodrat	Chambers Group 1992c
Lepus californicus	blacktail jackrabbit	USFWS 1988
Sylvilagus audubonii	desert cottontail	USFWS 1988
Equus asinus	Feral burro	Chambers Group 1992c
Ovis canadensis nelsoni	Nelson's desert bighorn sheep[1]	Chambers Group 1992c

[1] **Sensitive species, addressed in Section 3.5.4.**

Amphibians

One amphibian species is likely to occur within the study area. Approximately 50 tadpoles of the red-spotted toad (*Bufo punctatus*) were observed in a manmade cement wading pool at the Sheep Creek Spring biological research station in the foothills of the Avawatz Mountains (Chambers Group 1992c). One other individual was observed at Paradise Springs in the southern portion of the study area (MBA 1991). No other amphibians were observed in the study area; however, any of the active springs could potentially support amphibian species, even springs that are active only part of the year.

Reptiles

The reptilian species observed in the study area are characteristic of those found in creosote scrub habitat. Zebra-tailed lizards (*Callisaurus draconoides*), side-blotched lizards (*Uta stansburiana*), and western whiptails (*Cnemidophorus tigris*) were common throughout the study area. Other lizard species observed included the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), collared lizard (*Crotophytus collaris*), and the desert iguana (*Dipsosaurus dorsalis*).

The chuckwalla (*Sauromalus obesus*) is likely to occur throughout the rocky substrate of the Avawatz, Alvord, and other mountain ranges in the study area. It was observed in the eastern portion of the study area by Chambers Group biologists in April 1992 (Chambers Group 1992b) and in the Alvord Mountains and Goldstone area in the southern portion of the study area (MBA 1991). The desert tortoise (*Gopherus agassizii*) occurs in varying densities throughout the area, and the Mojave fringe-toed lizard (*Uma scoparia*) occurs in the active dune systems and other blow sand habitats in the eastern and southern portions of the study area (Sierra Delta Corporation [SDC] 1990; KBC 1991; MBA 1991; Chambers Group 1992e; Chambers Group 1992f; and Chambers Group 1992c). Additional information on these species is presented in Section 3.5.4.

Snakes observed include the coachwhip (*Masticophis flagellum*), gopher snake (*Pituophis melanoleucus*), western patch-nosed snake (*Salvadora hexalepis*), western shovel-nosed snake (*Chionactis occipitalis*), and the sidewinder (*Crotalus cerastes*) (MBA 1991; Chambers Group 1992c).

Birds

Most of the bird species observed are representative of creosote scrub habitat. Some of the more common bird species in the study area include black-throated sparrows (*Amphispiza bilineata*), rock wrens (*Salpinctes obsoletus*), common raven (*Corvus corax*), and greater roadrunner (*Geococcyx californianus*).

In most cases, the greatest bird activity was observed in the immediate vicinity of active springs. Springs are a valuable resource to most resident and migratory bird species. Birds observed in the eastern portion of the study area include the fox sparrow (*Passerella iliaca*) and yellow-rumped warbler (*Dendroica coronata*) around Sheep Creek Spring, and the great blue heron (*Ardea herodias*) and Hutton's vireo (*Vireo huttoni*) in the immediate vicinity of Owl Hole Spring. Springs in the southern portion of the study area (Paradise Spring, for example) also support a variety of resident and migratory species (MBA 1991; Chambers Group 1992c).

Avian activity was also high within the Joshua tree woodland in the Superior Valley and surrounding vicinity. This is probably due to the denser vegetative cover, higher plant species diversity, and greater vertical stratification of vegetation in this region. Ash-throated flycatchers (*Myiarchus cinerascens*), western kingbirds (*Tyrannus verticalis*), and Scott's orioles (*Icterus parisorum*) are common late spring and summer breeders in the Joshua tree habitat in the southern portion of the study area (MBA 1991).

Red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), golden eagle (*Aguila chrysaetos*), and prairie falcons (*Falco mexicanus*) are some of the raptors observed foraging and roosting within the study area (MBA 1991; Chambers Group 1992c). Many raptor species will use the cliff faces and rocky ledges of mountain ranges in the study area as sites to roost or nest.

Mammals

Numerous mammal species were observed or detected within the study area. Small mammals most frequently observed throughout the study area include blacktail jackrabbits (*Lepus californicus*) and whitetail antelope squirrels (*Ammospermophilus leucurus*). Other rodent species observed include the desert kangaroo rat (*Dipodomys deserti*), Merriam's kangaroo rat

(*D. merriami*), long-tailed pocket mouse (*Perognathus formosus*), little pocket mouse (*P. longimembris*), and desert woodrat (*Neotoma lepida*) (MBA 1991; Chambers Group 1992c). The Mohave ground squirrel also occurs within the study area and is addressed in Section 3.5.4.

Larger mammal species occurring in the study area include the coyote (*Canis latrans*) and the kit fox (*Vulpes macrotis*), both of which are expected to occur throughout the study area. Other larger mammals include the badger (*Taxidea taxus*) and Nelson's bighorn sheep (*Ovis canadensis nelsoni*). These species are addressed in Section 3.5.4.

Mines and natural caves are located throughout the study area and provide potential roosting habitat for bats. Bats will also use the many cliff faces and rocky ledges of mountain ranges in the study area as sites for roosting. One western pipistrell (*Pipistrellus hesperus*) was found inside a mine in the eastern portion of the study area. Numerous other unidentified bat species were also observed at dusk near Denning Spring (dry) in the Avawatz Mountains and in Spanish Canyon in the southern portion of the study area (MBA 1991; Chambers Group 1992c).

3.5.4 Sensitive Wildlife Issues

3.5.4.1 Sensitivity Analysis

Table 3.5-4 provides a list of sensitive wildlife known to occur or that may potentially occur in the study area. Sensitive wildlife includes all listed Federal and State Endangered and Threatened Species, FSOC, and California Species of Concern (CSC). Sensitive species were included in this table if their known geographical distribution encompassed part of the study area or if their distribution was near the study area and general habitat requirements of the species had been met. The table also indicates the potential for each species to occur in the study area. The "potential for occurrence" ranking is based on the following criteria:

- Species Present - The species was observed in the study area at the time of the survey.
- High potential for occurrence - Both a historical record of the species in the study area or its immediate vicinity AND the diagnostic habitats strongly associated with the species do occur in the study area or its immediate vicinity.
- Moderate potential for occurrence - Either a historical record of the species exists in the study area or its immediate vicinity OR the diagnostic habitats associated with the species do occur in the study area or its immediate vicinity.
- Low potential for occurrence - No present or historical records exist of the species occurring in the study area or its immediate vicinity AND the diagnostic habitats strongly associated with the species do not occur in or in the immediate vicinity of the study area.

Invertebrates

Four sensitive invertebrate species, all insects, could potentially occur in the eastern portion of the study area. The Death Valley june beetle (*Polyphylla erratica*), Saratoga Springs belostoman bug (*Belostoma saratogae*), and the Amargosa naucorid bug (*Pelocoris shoshone*) are all FSOCs that have been found (CNDDB) at Saratoga Springs located approximately 3 miles north of the northeastern boundary of the study area. None of these three species have been documented in the study area recently; however, the Amargosa naucorid bug has historically occurred within the study area boundary. The CNDDB has an old sighting (1953) of the naucorid bug at Sheep Creek Spring in the Avawatz Mountains. This species has a high potential of occurrence within the study area. All three species are closely associated with desert riparian habitats, relying on riparian vegetation for cover and food (Borror and White 1970). A fourth sensitive invertebrate species is the butterfly *Icarcia icarioides* found in the higher elevations (>4,000 feet) of north China Lake; it is also an FSOC. This population appears to be unique to the area but could potentially occur in the study area.

One other butterfly species of concern, *Euphilotes battoides panamintensis*, may occur in the study area as well. Although not threatened, it is an uncommon species restricted to well-watered desert canyons and along northern exposures.

Fishes

Both the Amargosa pupfish (CSC) and the Amargosa Canyon speckled dace (FSOC, CSC) are known to occur in the Amargosa River in the eastern portion of the study area. Both species were observed during reconnaissance surveys by Chambers Group biologists

Table 3.5-4

THREATENED, ENDANGERED AND WILDLIFE SPECIES OF CONCERN OCCURRING OR POTENTIALLY OCCURRING WITHIN STUDY AREA

Species/Common Name	Federal Status	State Status	Potential of Occurrence	Remarks	Source
Polyphylla erratica Death Valley June beetle	FSOC	- - -	M	This species known to occur in the Saratoga Springs, just north of the study area.	Chambers Group 1992c
Belostoma saratogae Saratoga Springs belostoman bug	FSOC	- - -	M	This species known to occur in the Saratoga Springs, just north of the study area.	Chambers Group 1992c
Pelocoris shoshone Amargosa naucorid bug	FSOC	- - -	H	This species historically found in the Saratoga Springs, just north of the study area. Also historically found at Sheep Creek Spring in the study area.	Chambers Group 1992c
Icarcia icarioides unnamed butterfly	FSOC	- - -	M	Has been found northwest of the study area in China Lake area. Could potentially occur in the study area.	Pratt and Pierce 1995
Euphilotes battoides panamintensis unnamed butterfly	- - -	CSC	M	Usually found in well-watered canyons and along northern exposures. Could potentially occur in the study area.	Pratt and Pierce 1995
Rhinichthys osculus ssp. Amargosa Canyon Speckled Dace	FSOC	CSC	H	This species is known to occur in the Amargosa River. Historically occurred at the Salt Creek Hills ACEC.	Chambers Group 1992b
Cyprinodon nevadensis amargosae Amargosa pupfish	- - -	CSC	H	This species known to occur in the Amargosa River. Was observed in the river adjacent to Hwy 127. Historically occurred at the Salt Creek Hills ACEC.	Chambers Group 1992b
Cyprinodon nevadensis nevadensis Saratoga Springs pupfish	- - -	CSC	H	This species known to occur in the Saratoga Springs just north of the study area.	Chambers Group 1992b
Gopherus agassizii desert tortoise	FT	T	P	Species present onsite, see text.	Chambers Group 1992f
Uma scoparia Mojave fringe-toed lizard	- - -	CSC	P	Species present onsite, see text.	Chambers Group 1992c
Sauromalus obesus chuckwalla	FSOC	- - -	P	This species was observed in April 1992 in the rocky habitat just east of the Avawatz Mountains. Probably occurs in all suitable rocky habitat within the study area.	Chambers Group 1992b; USFWS 1988
Accipiter striatus sharp-shinned hawk	- - -	CSC	P	Species present onsite.	MBA 1991
Accipiter cooperii Cooper's hawk	- - -	CSC	P	Species present onsite.	MBA 1991
Buteo regalis ferruginous hawk	FSOC	CSC	M	Suitable foraging habitat and prey onsite. Winter visitor that may occur in low numbers.	Chambers Group 1992c

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Table 3.5-4

THREATENED, ENDANGERED AND WILDLIFE SPECIES OF CONCERN OCCURRING OR POTENTIALLY OCCURRING WITHIN STUDY AREA

Species/Common Name	Federal Status	State Status	Potential of Occurrence	Remarks	Source
Circus cyaneus northern harrier	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Buteo swainsoni Swainson's hawk	- - -	T	L	Suitable foraging habitat onsite. Uncommon but may occur as a transient.	Chambers Group 1992c
Aquila chrysaetos golden eagle	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Falco mexicanus prairie falcon	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Asio flammeus short-eared owl	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Asio otus long-eared owl	- - -	CSC	H	CNDDB has records of this species nesting on salt creek. None observed during the survey. Suitable foraging habitat onsite.	Chambers Group 1992c
Athene cunicularia burrowing owl	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Polioptila melanura black-tailed gnatcatcher	- - -	*	P	Species present onsite.	Chambers Group 1992c
Melanerpes uropygialis Gila woodpecker	- - -	E	P	Species present onsite.	Chambers Group 1992c
Eremophila alpestris actia horned lark	FSOC	CSC	P	Species present onsite.	Chambers Group 1992c
Coccyzus americanus occidentalis western yellow-billed cuckoo	- - -	E	M	This species was not observed onsite; however, it is known to occur on the Amargosa River northeast of the study area. Requires densely foliaged trees (willows) for roosting sites.	Chambers Group 1992c
Lanius ludovicianus loggerhead shrike	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Toxostoma crissale crissal thrasher	- - -	CSC	L	Uncommon and local in the deserts. Habitat onsite mostly unsuitable. Low probability of occurrence. Requires dense, shrubby vegetation along streams and washes.	Chambers Group 1992c

Table 3.5-4

THREATENED, ENDANGERED AND WILDLIFE SPECIES OF CONCERN OCCURRING OR POTENTIALLY OCCURRING WITHIN STUDY AREA

Species/Common Name	Federal Status	State Status	Potential of Occurrence	Remarks	Source
Toxostoma lecontei LeConte's thrasher	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Toxostoma bendirei Bendire's thrasher	- - -	CSC	L	Common but localized in scattered areas. Ideal habitat occurs in areas of Mojave yucca and cholla cactus. Very low probability of occurring in study area.	Chambers Group 1992c
Dendroica petechia brewsteri yellow warbler	- - -	CSC	P	Species present onsite.	MBA 1991
Antrozous pallidus pallid bat	- - -	CSC	P	Species present onsite.	Chambers Group 1992c
Choeronycteris mexicana Mexican long-tongued bat	FSOC	CSC	L	Inhabits natural caves and old mine tunnels. May occur as a transient; range is south of the study area.	Chambers Group 1992c
Euderma maculatum spotted bat	FSOC	CSC	H	Inhabits arid country and occasionally enters caves. This rare species probably occurs in the region; range extends throughout the study area.	Chambers Group 1992c
Eumops perotis californicus California mastiff bat	FSOC	CSC	H	Inhabits crevices, tunnels, and trees. Probably occurs in the region; range extends throughout study area.	Chambers Group 1992c
Myotis lucifugus occultus occult little brown bat	FSOC	CSC	L	Inhabits caves, mine tunnels, or hollow trees. Usually feeds on insects near water. May occur as a transient or uncommon winter visitor; range does not reach study area.	Chambers Group 1992c
Myotis velifer brevis southwestern cave myotis	FSOC	CSC	L	Inhabits crevices, caves, mine tunnels. May occur as a transient; range may overlap part of study area.	Chambers Group 1992c
Plecotus townsendii townsendii Townsend's western big-eared bat	FSOC	CSC	H	Inhabits caves and mine tunnels. Probably occurs in the region; range extends throughout the western U.S.	Chambers Group 1992c
Nyctinomops (= *Tadarida*) *macrotis* big free-tailed bat	- - -	CSC	L	Species is rare in California. Uses rock crevices for roosting sites. May occur as a transient.	MBA 1991
Spermophilus mohavensis Mohave ground squirrel	FSOC	T	P	Species has been documented in the northwestern portion of the study area and in the valley west of the Paradise Range. CNDDB has records of this species west of Avawatz Mountains. Low probability of occurrence on the east side of the Avawatz Mountains.	Chambers Group 1992c MBA 1991 FWS 1988

Table 3.5-4

THREATENED, ENDANGERED AND WILDLIFE SPECIES OF CONCERN OCCURRING OR POTENTIALLY OCCURRING WITHIN STUDY AREA

Species/Common Name	Federal Status	State Status	Potential of Occurrence	Remarks	Source
Perognathus longimembris brevinasus Los Angeles little pocket mouse	FSOC	CSC	H	Range extends throughout the study area. Gravelly soils are habitat requirement, found in most of the study area.	Chambers Group 1992c
Onychomys torridus ramona Southern grasshopper mouse	FSOC	CSC	P	Inhabits low deserts with creosote bush, mesquite, and yucca. Species was observed during field studies conducted in 1988.	USFWS 1988
Ovis canadensis nelsoni Nelson's bighorn sheep	- - -	*	P	A population of this species has been known to frequent Avawatz Mountains.	Chambers Group 1992c
Taxidea taxus American badger	- - -	*	H	This species probably occurs in low numbers in the region. Burrows and scat were observed during surveys.	Chambers Group 1992c

Status

FT = Listed as threatened by the U.S. Fish and Wildlife Service
FSOC = Federal Species of Concern - former Federal Candidate Species
E = Listed as endangered by the California Department of Fish and Game (CDFG)
T = Listed as threatened by the CDFG
CSC = CDFG Species of Special Concern

*** Taxa fall into one of the following categories:**

- **Taxa considered endangered or rare under Section 15380(d) of CEQA guidelines**
- **Taxa that are biologically rare, very restricted in distribution, or declining throughout their range**
- **Population(s) in California that may be peripheral to the major portion of a taxon's range, but which are threatened with extirpation within California**
- **Taxa closely associated with a habitat that is declining in California at an alarming rate (e.g., wetlands, riparian, old growth forests, desert aquatic systems, native grasslands)**

Potential Occurrence

P = Species Present **L = Low Potential for Occurrence** **M = Moderate Potential for Occurrence** **H = High Potential for Occurrence**

in April 1992 (Chambers Group 1992b). It is highly probable that, during the spring after heavy rains, running tributaries of the Amargosa River (within study area boundaries) support populations of both species. The same is true for Salt Creek, also in the eastern portion, which flows for at least part of the year. Both the Amargosa pupfish and the Amargosa Canyon speckled dace are CSCs.

Amphibians

Sensitive amphibian species were not observed in the study area, and there are no historical records of sensitive amphibian species in the study area.

Reptiles

Desert Tortoise

The desert tortoise, a Federal and State Threatened Species, is an herbivorous reptile found in portions of California, Arizona, Nevada, and Utah deserts. It also occurs in Sonora and Sinaloa, Mexico. It is the only species of native tortoise occurring within its range. Other members of the genus include the Texas tortoise of southern Texas, the Bolson tortoise of north-central Mexico, and the gopher tortoise of southeastern United States.

In California, the desert tortoise is found in a wide range of elevations, with the exception of extremely low desert and higher montane habitats. Its range roughly approximates the distribution of the creosote bush throughout the southwestern deserts.

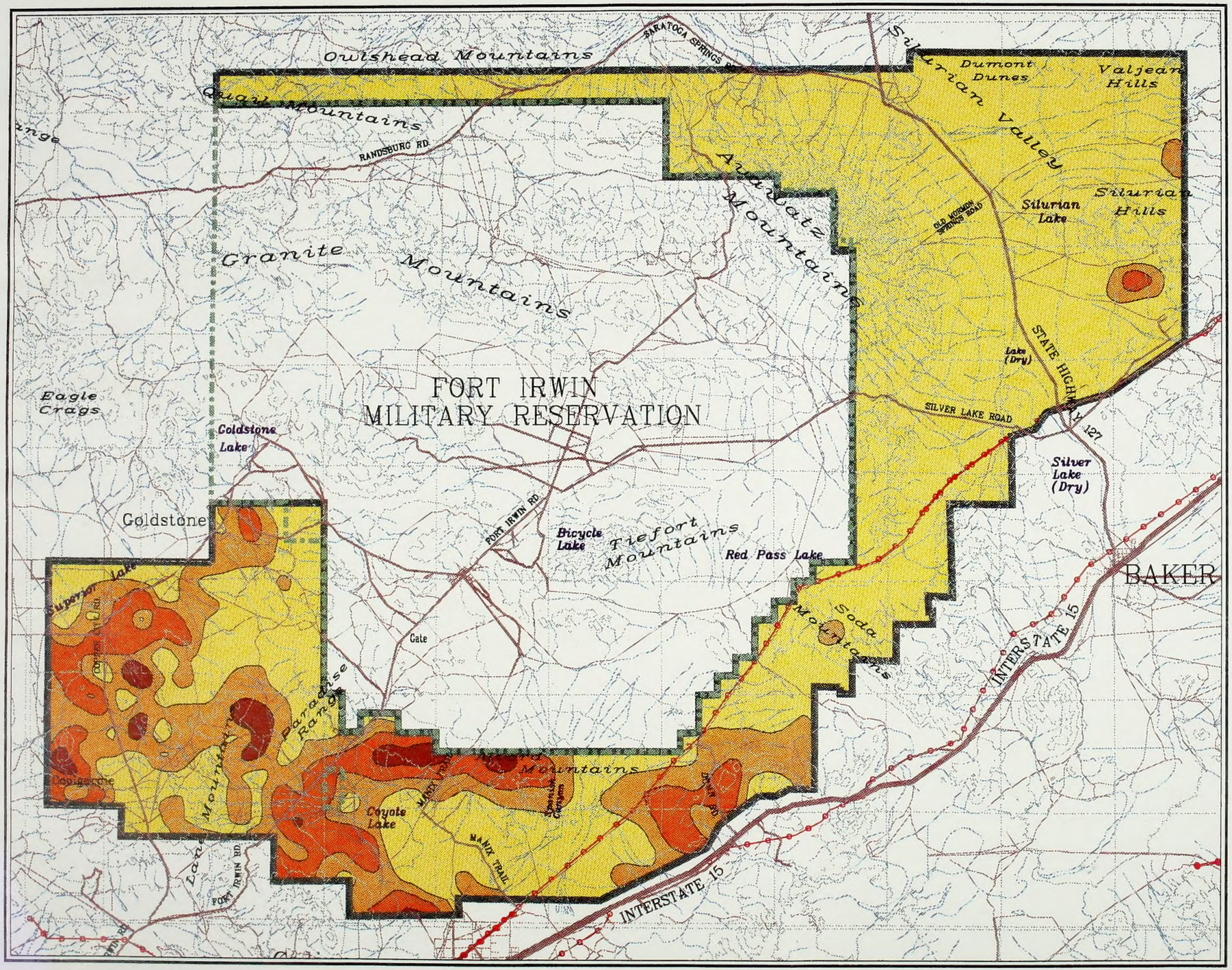
Desert tortoises spend a large portion of the year underground avoiding extreme temperatures and, for younger tortoises, a variety of predators, such as coyotes, foxes, raptors, and ravens. They construct and maintain single opening burrows, with an individual tortoise using several burrows within its home range. They will also use natural overhangs in wash walls when soil conditions are not favorable for burrow construction.

Generally, tortoises are active during the spring, early summer, and autumn when annual plants are most common and daily temperatures are tolerable. Additional activity occasionally occurs during warm weather in winter months and after summer rain storms. In the western Mojave Desert, tortoises tend to concentrate their activity period largely in the spring and early summer during the spring bloom. They display a more bimodal yearly activity pattern in the eastern portions of their range where winter and summer rainfall patterns normally result in fresh forage being available in both the spring and fall.

The USFWS determined that the desert tortoise warranted listing in response to increasing habitat disturbance and increased mortality over portions of its range. The cause of this increased mortality was initially thought to be caused by the spread of upper respiratory tract disease (URTD), formerly referred to as upper respiratory disease syndrome (URDS). Subsequent investigations of the disease have led to speculation that the disease may be, at least partially, stress-related. Increased stress may be a result of the desert-wide drought, which occurred over 6 years during the late 1980s and early 1990s, and has resulted in lower-than-normal production of annual plant biomass. Only one case of URTD has been confirmed in a desert tortoise in the study area. This animal was collected from Fort Irwin Road. A number of diseased tortoises have been found south and west of the study area. High mortality rates of desert tortoises west of the study area have been documented (Chambers Group 1992d).

A small section of the southern portion of the study area has been subjected to limited livestock grazing. The potential effects of livestock grazing on tortoise food resources and survivorship have become growing concerns for desert tortoise biologists. Cattle grazing does occur on the southeastern portion of the study area (Cronese, perennial/ephemeral cattle allotment).

In 1988, approximately 330 square miles of the study area were surveyed for desert tortoises by the USFWS. Following this study, another tortoise density survey was conducted over an additional 386 square miles of land that were either proposed for use by the NTC or considered an isolation area (Chambers Group 1990a). Figure 3.5-3 shows the data compiled from these and other tortoise surveys conducted in the vicinity of, and including, the NTC. The purpose of these surveys was to determine the distribution and density of the desert tortoises within the study area and in areas that could be isolated by proposed activities. Identical methodology was used in both of these surveys and consisted of estimating distribution and density using the belt-transect method developed by Berry and Nicholson (1984). In the 1990 survey, a higher density of survey transects was completed



Explanation

- 0-19 Tortoises per Square Mile
- 20-49 Tortoises per Square Mile
- 50-99 Tortoises per Square Mile
- 100-249 Tortoises per Square Mile
- Power/Transmission Lines

(1 square mile = 640 acres)

Entire Study Area
TORTOISE DENSITIES
Figure 3.5-3

Chambers Group, Inc.
5 2.5 1.25 0 5 Miles
1" = 30000'
Project# 6347
December 04, 1996

December 04, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

(approximately one transect per square mile as compared to one transect per 3 to 4 square miles in the 1988 survey). The transect technique is based on the assumption that the frequency of tortoise sign (scat and burrows) observed along a transect is related to the density of tortoises in the vicinity of the transect. Ninety transects were conducted during the 1988 survey, and 468 transects were conducted during the 1990 survey.

In January 1992, an intensive 100-percent coverage survey was conducted on a 3-square-mile area located within the southern boundary of the NTC in the vicinity of the north slope of the Alvord Mountains (Chambers Group 1992e). The study area was selected because it was determined to have an estimated tortoise density of 100 to 250 tortoises/ square mile based on previous surveys (Woodman et al. 1990). The area was surveyed by two teams of six biologists that lined up 10 m apart and then walked over the entire study area. The biologists documented all tortoise sign found during the survey and examined every burrow using a hand-held mirror and flashlight. All burrows that were too deep to examine were further examined using a miniature video camera that was placed down the burrow. All occurrences of live tortoises were documented. Forty-four live tortoises and 119 carcasses were found within the 3-square mile study area. In addition, specific notes were made about all tortoise carcasses found within the study area (Chambers Group 1992e). Those tortoise remains that could be interpreted appeared to be killed by predators, both mammalian and bird, and by crushing. Most of the carcasses were so disarticulated and fragmented that a cause of death could not be determined.

In July and August 1992, a large-scale survey for desert tortoises was conducted on the north slope of the Alvord Mountains (Chambers Group 1993). This survey area, encompassing approximately 70 square miles, lies partially within the southern boundary of the NTC and partially south of the boundary. Two different transect survey methods were used to complete the summer portion of the survey. One method, developed by Chambers Group, consisted of 269 transects, placed systematically within each square mile, at a density of four per square mile. During the survey, data were collected on tortoise sign, vegetation, and soils, in addition to a number of other habitat components. A global positioning system was used to accurately identify the locations of the transects and corresponding data. The second method used in the survey consisted of walking 134 standard BLM tortoise transects at a density of two per square mile. These transects were also systematically placed within each square mile, which is not the standard way to place the transects in the BLM method. In previous applications of the survey method, the biologist placed each transect in "homogeneous habitat." In this study, in order to avoid any bias in the placement of the BLM transects, a computer was used to systematically place them.

In September and October 1992, a survey for desert tortoise was conducted in the Silurian Valley portion of the study area (Chambers Group 1992f). The initial sweep consisted of approximately one standard BLM transect per square mile. Areas consisting of more than 20 percent slope were not surveyed for desert tortoises. The results show that very little occupied habitat is in the Silurian Valley. The low elevations and the extremely rocky soils, particularly west of State Highway 127, are likely important factors in making the area unsuitable for tortoises. The only areas where any tortoise sign was found were just north and south of the Silurian Hills. The total size of these occupied areas is approximately 23 square miles. The average density of tortoises within these isolated areas is approximately 26 tortoises per square mile, with all but 13 of the 23 square miles with density estimates of less than 20 tortoises per square mile. This is in contrast to the entire Silurian survey area, with an average density of two tortoises per square mile. These isolated populations may or may not be associated with a larger, more contiguous tortoise population to the immediate east of the Silurian study area.

Figure 3.5-3 shows the occupied desert tortoise habitat within the study area. Table 3.5-5 summarizes the area of each desert tortoise density category. The highest concentrations of desert tortoises within the study area occur in the southwestern portion near Lane Mountain and Mud Hills (approximately 250 to 500 tortoises per square mile) and in the southern portion near Alvord Mountain (100 to 249 per square mile). The lowest concentrations of desert tortoises occur in the eastern and western portions of the study area. A small population (from 20 to 99 tortoises per square mile) occurs in the eastern portion, north of the Silurian Hills. It appears that the distribution of tortoises roughly follows elevational changes across surveyed lands, with the highest tortoise density generally occurring at higher elevations (2,000 to 3,000 feet, excluding local physiographic features such as mountain ranges) and lower tortoise densities occurring at elevations less than 1,000 feet.

Table 3.5-5

AREAS OF DESERT TORTOISE HABITAT WITHIN THE STUDY AREA (acres)

Density Category (tortoise/mi^2)	Area
0 - 19	460,506
20 - 49	101,161
50 - 99	50,498
100 - 249	9,804
> 250	0

In 1988, the BLM prepared a rangewide management plan for the desert tortoise with the goal of managing habitat to ensure that viable desert tortoise populations continue to exist on public lands. Part of the plan included categorizing tortoise habitat into interim habitat management categories based on the following criteria; importance of habitat to maintaining viable populations, resolvability of conflicts, tortoise density and population status. Different land management actions are implemented based on the category assigned to the lands.

Category 1 habitat is the most important in maintaining stable, viable populations and also in the potential for increasing tortoise numbers. Category 2 habitat corresponds to areas that are managed to maintain stable, viable populations and to halt further declines in the numbers. Category 3 habitat is of least importance in terms of its ability to contribute to sustaining viable populations.

The study area contains Category 1 and Category 2 habitat (Figure 3.5-4). The southern portion of the study area between Interstate 15 (I-15) and Fort Irwin is classified as Category 2 habitat. The western border of the study area from Fort Irwin to Superior Lake is classified as Category 1 habitat.

Critical Habitat, a formal designation of lands deemed necessary for the recovery of federally listed species, was identified for the desert tortoise by the USFWS in 1994. The USFWS, under Section 4 (a)(3) of the Endangered Species Act of 1973, as amended, is required to designate Critical Habitat when a determination is made that a species warrants listing as threatened or endangered. Critical Habitat is the specific areas within the geographic area occupied by the species on which are found those physical or biological features essential to their conservation or protection. This may include specific areas outside the geographical area currently occupied by the species. Eight critical habitat units for the desert tortoise totaling nearly 4.8 million acres have been designated in California. The critical habitat unit, which encompasses approximately 766,900 acres, is the only one of the eight that occurs in the study area. The study area encompasses approximately 282,214 acres of this critical habitat unit (Figure 3.5-5).

Mojave Fringe-Toed Lizard

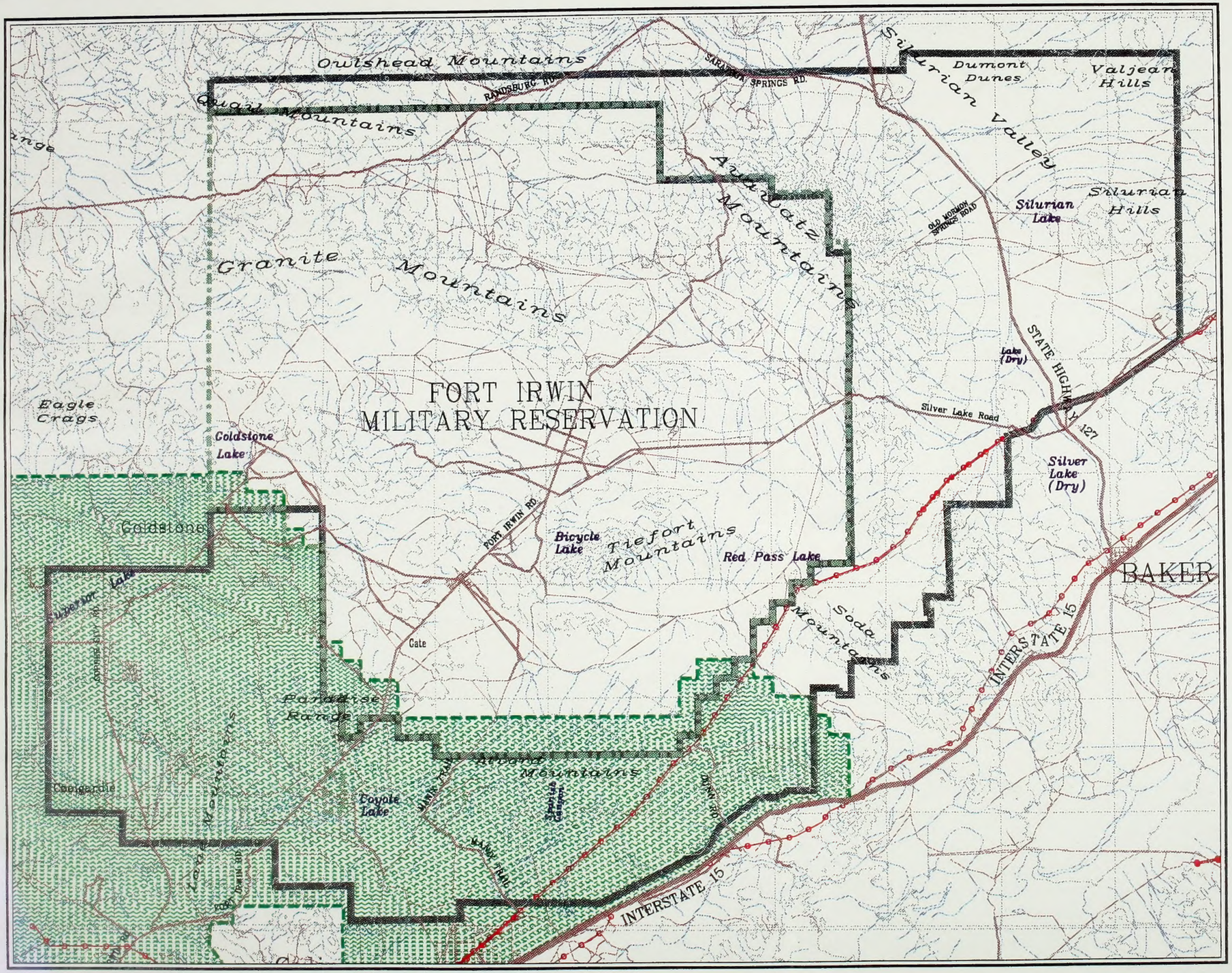
A well-established population of the Mojave fringe-toed lizard exists in the eastern portion of the study area in the dune system along the northeastern border of the study area. The Mojave fringe-toed lizard has also been observed along a dune system on the eastern side of the Soda Mountains in the southern portion of the study area. This species is a specialist of sandy substrate, with highly adapted morphological features specific for life in the sand. Many tracks were observed throughout the sandy areas associated with dune habitat. The Mojave fringe-toed lizard is currently listed as a CSC.

Chuckwalla

The chuckwalla was observed near Old Mormon Spring in the foothills of the Avawatz Mountains during a reconnaissance survey conducted by Chambers Group biologists in April 1992 (Chambers Group 1992b). It is also known to occur in the Goldstone area and Alvord Mountains in the southern portion of the study area (MBA 1991). The requirements of this lizard are rocky habitats with plenty of basking sites and a diet of predominantly annual vegetation. Most of the rocky and/or mountainous habitats within the study area, such as the Avawatz and Alvord Mountain ranges, provide suitable habitat for this species. This lizard is currently considered an FSOC.

Birds

Numerous sensitive bird species have been observed in the study area. Many areas within the study area provide suitable habitat for sensitive raptoral and passerine species, including springs, cliff faces, rocky



Explanation

- Critical Desert Tortoise Habitat
- Power/Transmission Lines

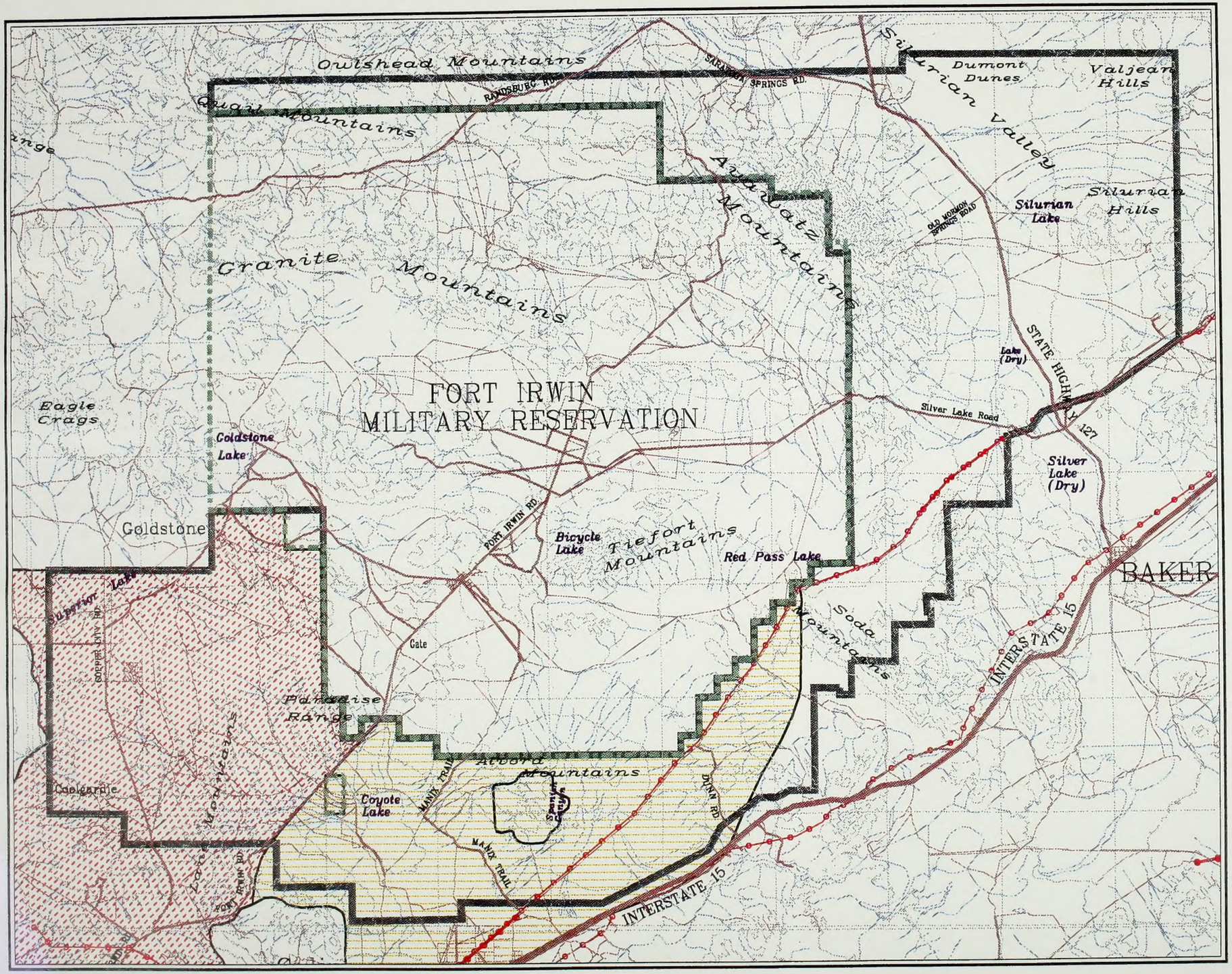
Entire Study Area
DESERT TORTOISE CRITICAL HABITAT
Figure 3.5-4

Chambers Group, Inc.

5 2.5 1.25 0 5 Miles

1" = 30000'
Project# 6347
November 22, 1996

November 22, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml



Explanation

- Category 1
- Category 2
- Power/Transmission Lines

Entire Study Area
BLM DESERT TORTOISE HABITAT MANAGEMENT CATEGORIES
Figure 3.5-5

Chambers Group, Inc.

1" = 30000'
Project# 6347
November 22, 1996

5 2.5 1.25 0 5 Miles

ledges, and Joshua tree woodland habitat. The following paragraphs briefly describe these sensitive bird species and the habitat in which they are found.

Northern Harrier

The northern harrier was observed foraging in the eastern portion of the study area and is expected to occur throughout the area (USFWS 1988; MBA 1991; Chambers Group 1992c). This species frequents aquatic habitats, such as wetlands, freshwater and salt-water marshes, wet meadows, and tundra. The winter range of this species extends throughout southern California, and it may use areas such as active springs and other watercourses in the study area for roosting and foraging sites. This species is listed as a CSC.

Golden Eagle

Both adult and juvenile golden eagles (*Aquila chrysaetos*) were observed in the eastern portion of the study area and are expected to forage throughout the site (USFWS 1988; MBA 1991; Chambers Group 1992c). The rocky habitat of the Avawatz, Alvord, and similar mountain ranges provides adequate roosting and nesting sites. Prey species of the golden eagle (rodents and rabbits) occur in high numbers within the study area. The golden eagle is currently a CSC and is protected under the federal Eagle Protection Act.

Prairie Falcon

The prairie falcon has been observed foraging in all portions of the study area and is likely to be a permanent resident in the study area (USFWS 1988; MBA 1991; Chambers Group 1992c). The numerous cliffs and rocky outcrops of the Avawatz and similar mountain ranges provide many roosting and nesting sites, and adequate densities of small mammals, birds, and reptiles (all prey species) occur throughout the study area. The prairie falcon is currently listed as a CSC.

Short-Eared Owl

The short-eared owl (*Asio flammeus*) was observed on seven different occasions east of Salt Creek Hills in the eastern portion of the study area (Chambers Group 1992c). This species is not commonly found inland in southern California; however, it is found locally in some southern desert regions. Some areas along Salt Creek and the Amargosa River provide patches of dense vegetation required for nesting and roosting sites. This species feeds primarily on small mammals, reptiles, and amphibians, all of which are found within the study area. This species is listed as a CSC.

Burrowing Owl

Burrowing owls (*Athene cunicularia*) were observed on many occasions throughout the study area and are most likely a permanent resident (USFWS 1988; MBA 1991; Chambers Group 1992c). This species is primarily insectivorous but will also take small mammals, reptiles, birds, and carrion. Individuals typically use old rodent burrows for nesting sites. The burrowing owl is currently listed as a CSC.

Gila Woodpecker

One Gila woodpecker (*Melanerpes uropygialis*) was observed at the Sheep Creek Spring research station in the foothills of the Avawatz Mountains in the eastern portion of the study area (Chambers Group 1992c) (Figure 3.5-6). The range of this species in California is primarily along the Colorado River and in parts of Imperial County, but it may wander during nonbreeding seasons (CDFG 1990). This individual may be a transient, using the many springs as water resources. Gila woodpeckers typically use desert riparian trees for cover (mainly cottonwoods) and feed mainly on insects. The Gila woodpecker is currently listed in California as an Endangered Species.

Horned Lark

Horned larks (*Eremophila alpestris actia*) were observed in substantial numbers throughout much of the study area and are most likely a permanent resident (USFWS 1988; MBA 1991; Chambers Group 1992c). This species feeds primarily on insects and builds its nest on the ground in the open. Grasses and shrubs are usually used as cover. This species was formerly listed as a Federal Candidate Species, but it has since been eliminated from consideration. It is a CSC.

Black-Tailed Gnatcatcher

The black-tailed gnatcatcher (*Polioptila melanura*) was observed on three occasions in the eastern portion of the study area (Chambers Group 1992c) and likely occurs throughout the study area. This species uses shrubs for roosting, nesting, and other cover, and gleans insects and spiders from foliage of shrubs. The black-tailed gnatcatcher is listed as a CSC.

Loggerhead Shrike

The loggerhead shrike (*Lanius ludovicianus*) was observed throughout the study area (USFWS 1988; MBA 1991; Chambers Group 1992c). The entire study area lies within the species' range, and it is more than likely a permanent resident. Loggerhead shrikes are primarily insectivorous, but will also take small birds, mammals, amphibians, reptiles, fishes, and carrion. Nests are built fairly high (0.4 to 15 m aboveground) in the canopy of densely foliaged shrubs or trees. Most of the springs (both active and dry) and some of the washes within the study area have dense foliage, which would provide plenty of cover for nesting individuals. This species is currently listed as a CSC.

LeConte's Thrasher

LeConte's thrasher (*Toxostoma lecontei*) was observed on several occasions throughout the study area (USFWS 1988; MBA 1991; Chambers Group 1992c). The entire study area lies within this species' range, and a resident population of thrashers most likely exists. Insects are the primary prey of the species. Individuals will forage on the ground by probing and digging in leaf litter and soil with their long, curved bill. Nests are usually constructed in spiny shrubs or cactus. LeConte's thrasher is currently listed as a CSC.

Yellow Warbler

The yellow warbler (*Dendroica petechia*) probably occurs as a migrant, using the many springs within the study area as water resources. The yellow warbler is currently listed as a CSC.

Mammals

Bats

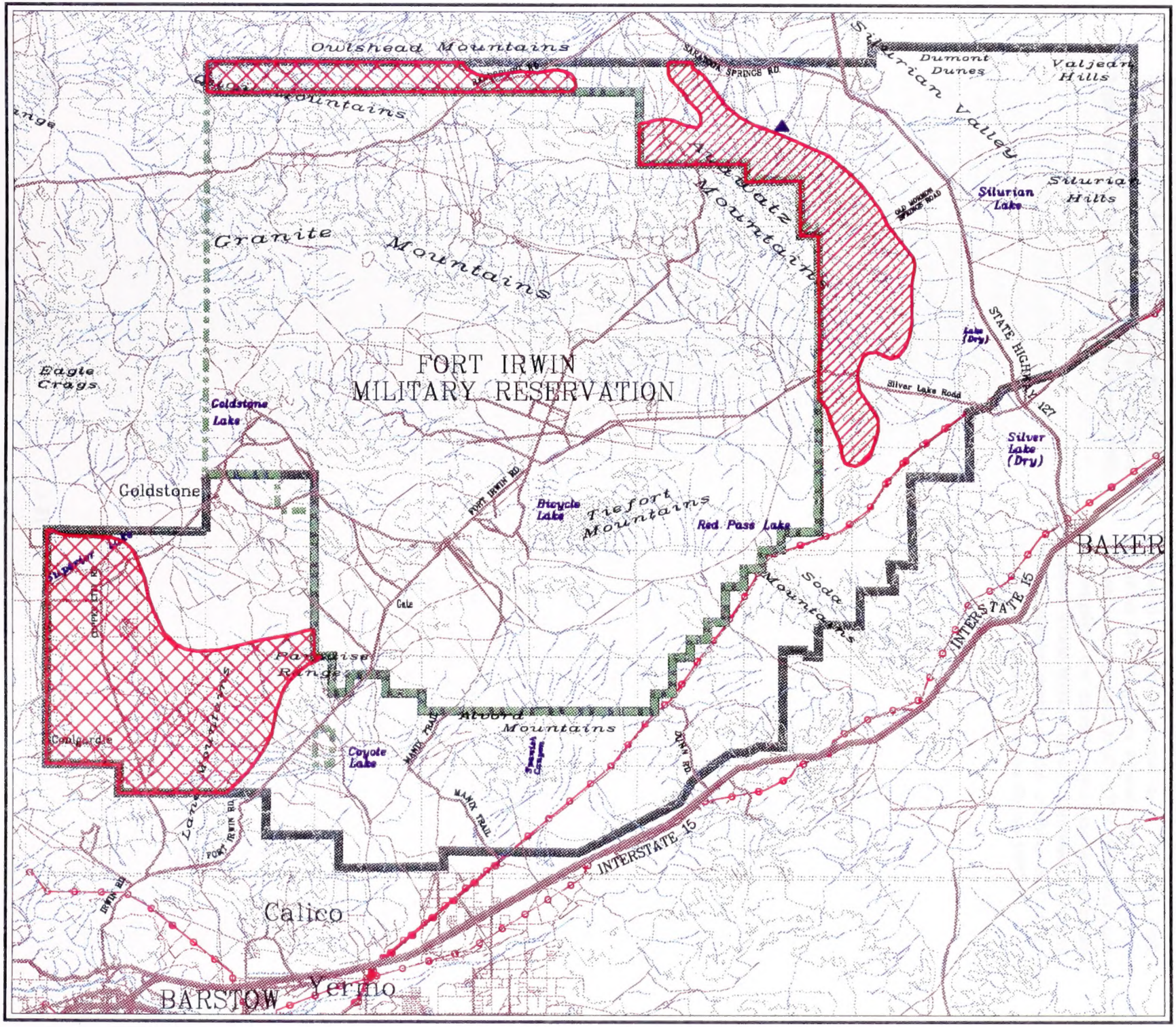
Eight sensitive bat species could potentially occur in the study area (see Table 3.5-4). Of these, one pallid bat (*Antrozous pallidus*) was observed at the entrance of a mine in the eastern portion of the study area. The numerous mineshafts, natural caves, and rocky outcrops provide very good habitat for this and other bat species to roost or nest. The resources in the study area will probably support both migratory and resident bat species. Bats are chiefly nocturnal and primarily insectivorous, and they also frequent permanent water sources, such as springs and rivers. The pallid bat is currently listed as a CSC.

Badger

One burrow and scat of a badger were observed in the eastern portion of the study area (Chambers Group 1992c). Badger sign was also observed on several occasions in the creosote scrub in the southern portion of the study area (MBA 1991). A high potential exists for this species to occur in low numbers throughout the study area because of the many areas of friable soils for burrow construction and high densities of prey species (rodents, particularly ground squirrels, and reptiles) throughout the area. The badger is currently listed as a CSC.

Mohave Ground Squirrel

The Mohave ground squirrel, an FSOC and State Threatened Species, has been documented in the northern portion of the study area (MBA 1991; Chambers Group 1992c) and has been observed on numerous occasions in the Coolgardie Mesa area and in the valley west of the Paradise Range (USFWS 1988). Figure 3.5-6 shows all known and potential Mohave ground squirrel habitat within the study area. Historical records of the CNDDB indicate that this species has also been found near Leach Lake, located within the NTC boundary, at an elevation of approximately 2,000 feet. Mohave ground squirrel habitat can generally be characterized as deep sandy soils located on alluvial fans usually at relatively high elevations. Members of the species are primarily granivorous, foraging on annual grasses and forbs within creosote scrub (MBA 1988).



Explanation

- Potential Mohave ground squirrel habitat
- Potential Nelson's bighorn sheep habitat
- Gila woodpecker sighting
- Power/Transmission Lines

Entire Study Area
SENSITIVE SPECIES OBSERVED AND POTENTIAL HABITAT OF SENSITIVE SPECIES

Figure 3.5-6

Chambers Group, Inc.

Project# 6347

MAP SCALE 1" = 40000'

5 2.5 1.25 0 5 Miles

November 22, 1996 - /gis1/plots/6347_ftirwin/plots/plot_8x11.aml

Nelson's Bighorn Sheep

Figure 3.5-6 shows all known and potential habitat for Nelson's bighorn sheep, a species that the CDFG considers sensitive because its range is becoming very limited. The CNDDB has records of this species occurring in the Avawatz Mountains, and the CDFG has been tracking a known population of Nelson's bighorn sheep in this region (Chambers Group 1992c).

Recent efforts have been made by the CDFG to increase the viability of the existing population of Nelson's bighorn sheep that migrates in and out of the Avawatz Mountains. Five young male bighorn sheep were introduced during the summer and fall of 1992. The five introduced males were taken from a successful population located near Old Dad Peak northwest of Kelso (Steve Ahmann and Andy Pauly, personal communication 1992). This effort was made to strengthen the current population and promote variation within bighorn herds. Movement corridors for this species occur on the northern end of the Avawatz Mountains (Chambers Group 1992c).

3.6 CULTURAL RESOURCES

This section presents the existing conditions that can be found in the study areas for cultural resources. The information presented is based primarily on studies prepared by Far Western Anthropological Group, Inc. (FWARG) of Davis, California, and Brian F. Mooney Associates (BFM) of San Diego, California. FWARG and BFM conducted record and literature searches for the entire proposed expansion area. As a result of these searches, it was determined that very little work had been conducted in the area. Therefore, surveys were conducted to determine the cultural values of the project area(s). Evaluations will be completed in accordance with the appropriate laws and regulations.

In accordance with a Programmatic Memorandum of Agreement (PMOA) in effect between the BLM, State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation with the State of California, the transfer of lands from BLM administration to the jurisdiction of other federal agencies (the Army) is an administrative action and not an undertaking. If the proposed land acquisition project is approved by Congress and an alternative is selected for acquisition and use, the military proposal for use of the land will constitute an undertaking. As such, the Army will be required to complete the Section 106 consultation process through the Advisory Council on Historic Preservation as required under the National Historic Preservation Act of 1966. The existing MOA with Fort Irwin, the Advisory Council on Historic Preservation, and the California SHPO will be reviewed and modified to include any acquired lands. The agreement, signed by the Commanding General, Fort Irwin, Director of Public Works, Office Chief of Engineers, the California SHPO, and the Chairman and Executive Director of the Advisory Council on Historic Preservation, requires that the Army proceed with the identification, evaluation, and mitigation process for cultural resources on lands withdrawn for military use and provide an opportunity for interested parties to comment on the process.

3.6.1 Archaeological Investigation

The archaeological research being conducted for the proposed land expansion is aimed at gaining a more refined understanding of the destruction of archaeological sites and the roles these sites might have played within past human behavioral systems. The research entails a series of components, including geomorphic mapping; pedestrian sample surveys of the proposed land expansion areas; paleoecological and paleoeconomic reconstruction for the region; examination of specific museum collections from existing sites; historic archival review; analysis of the results from the surveys, including evaluation of site types and their locations; and reconstruction of changing settlement and subsistence systems within the study areas. These results will be used by the Army to determine further action if land is acquired by NTC.

Archaeological literature and records searches were completed for all study areas using records housed at the BLM Resource Area Office in Barstow and the San Bernardino Information Center, San Bernardino County Museum. Sites recorded prior to the 1988 and 1993 surveys discussed below include 230 prehistoric sites, 148 historic sites, and 7 sites with both prehistoric and historic components.

In 1988, FWARG began a literature search and records check for the proposed Fort Irwin land acquisition (Mikkelson and Hall 1990). A cultural resources survey was also undertaken by FWARG in an effort to generate reliable expectations regarding the distribution and composition of prehistoric and historic cultural resources within the proposed expansion area. Work consisted of a 24,000-acre survey of public lands within a 365,000-acre area adjacent to Fort Irwin. A total of 130 prehistoric sites, 26 historic sites, and 1 prehistoric/historic site were recorded during the survey.

The 1993 survey conducted by BFM was in response to a change in alternatives proposed for the expansion. Approximately 150,000 acres, primarily within the Silurian Valley, were added to the study area (Byrd and Pallette 1994). Seven thousand acres were surveyed, resulting in the discovery of 33 sites: 14 prehistoric sites, 18 historic sites, and 1 prehistoric/historic site.

In 1995, BFM was contracted to conduct additional studies of the Silurian Valley area, including a detailed geomorphological analysis. A sample survey of approximately 12,700 acres, based on the results of the geomorphological study, resulted in the recording of 92 sites: 79 prehistoric sites, 9 historic sites, and 4 prehistoric/historic sites. A survey of 4,300 acres was completed in late 1995, and a survey of an additional 40,000 acres began in January 1996.

The proposed alternative areas contain 453 recorded prehistoric sites. The site types include flake scatters, flake and tool scatters, tool scatters (including ground stone), quarries, rockshelters, rock rings/alignments, trails, tool scatters, rock art, cairns, hunting blind, cleared circles, and single- and multiple-reduction loci. The 201 recorded historic sites, include mining sites, homesteads, roads, water development sites, trash dumps, a railroad, and military.

3.6.2 National Register Evaluations

Prehistoric and historic archaeological sites in the entire study area are fragile, nonrenewable resources representing over 12,000 years of human history. The importance of these sites lies in their ability to contribute information that can be used to develop an understanding of human adaptation to an arid, marginal environment over a great period of time. To do so effectively, the site must have integrity: integrity in its association with its environment, to other sites in the region, and the association of artifacts and features within a site to each other. Intrasite integrity allows for the placement of the deposit within a temporal framework as well as interpretation of site function. Site location relative to its environment can be used to interpret site type, site function, and behavioral aspects of the human society that left the site as a record of its existence. Interrelationships among sites yield the types of data that can be used to reconstruct details on society functions, movements of goods and people across the landscape, trade networks, social complexity, and mechanisms for adaptation to a desert environment. Insights on how prehistoric groups and early American settlers dealt with the problems associated with desert living can provide guidance for future decisions.

Sites are to be evaluated using the National Register of Historic Places (NRHP) criteria (36 CFR 60.4). Evaluations for the NRHP must consider the following:

- "The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

  1. that are associated with events that have made a significant contribution to the broad patterns of our history; or
  2. that are associated with the lives of persons significant in our past; or
  3. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
  4. that have yielded, or may be likely to yield, information important in prehistory" (36 CFR 60.4).

Cultural resource surveys often do not provide sufficient information for evaluating the eligibility of sites for the NRHP. Although data on artifacts and cultural features provide clues for interpreting the age, cultural affiliation, and function of archaeological sites, in the absence of excavation data and systematically obtained surface collections, there is no adequate method for assessing many site characteristics (for example, the total number and function of features, site size, and depth, and integrity of cultural deposits). Consequently, at the survey level of investigations, definitive statements regarding NRHP eligibility are commonly avoided in favor of qualifying statements. Rather than arguing that a particular resource or class of cultural resources is or is not significant based on its research potential, archaeologists usually divide sites between those that are potentially eligible and those that are not. Only those sites determined eligible for the NRHP in consultation with the SHPO are considered significant. Future mitigation will be required only for the historic properties determined eligible for the NRHP.

3.6.3 Native American Concerns

The American Indian Religious Freedom Act (AIRFA) requires that the Federal Government protect and preserve American Indians' inherent right of freedom to believe, express, and exercise their traditional religions, including but not limited to access to sites, use and protection of sacred objects, and the freedom to worship through ceremonial and traditional rites. It further directs that the various federal departments, agencies, and other instrumentalities responsible for administering relevant laws to evaluate their policies and procedures in consultation with native traditional religious leaders in order to determine changes

necessary to protect and preserve Native American cultural and religious practices.

Traditional cultural values are often central to the way a community or group defines itself and maintaining the group's sense of identity and self-respect. Properties to which traditional cultural value is ascribed often take on this kind of significance so that damage to or infringement upon them is perceived to be offensive to, and even destructive of, the group that values them. As a result, it is important that traditional cultural properties (TCPs) be considered in planning.

No Indian Reservation lands are located within the study area, although the Mojave River area located south of the study area has been identified as an area of high ethnographic importance to the Serrano, Vanyume, Chemehuevi/Paiute, and Mojave groups for both traditional use and religious sensitivity (Bean and Vane 1982). It was noted that, in most of the interviews with contemporary Native Americans, archaeological sites were considered to be important resources both as locations of past use and for the information they contain relative to each Native American group.

A contract was awarded for a preliminary ethnographic/ethnohistoric study of native cultures with potential past and current cultural/societal/spiritual interest within the boundaries of Fort Irwin and surrounding areas proposed for acquisition in the Mojave Desert. Results of the study indicate that Native American knowledge about cultural resources in the area appears rather limited, but concern about the interpretation and protection of archaeological sites is high. Ethnographic contacts for the study were not limited to members of federally recognized tribes. Any formal consultation between the government and Native Americans will be limited to recognized tribes, as required by AIRFA.

3.6.4 Culture History

Ever since Rogers (1939) and Campbell (1936) first offered regional prehistoric chronologies, the culture history of the Mojave Desert region has witnessed a proliferation of named "cultures," "industries," "phases," "stages," and "periods" (Warren 1984). These chronologies have been established in different subregions as well as in adjacent areas (Bettinger and Taylor 1974; Davis 1970; Hunt 1960; Lanning 1963; Wallace 1958, 1962, 1977, 1978; Warren and Crabtree 1986). Despite this apparent terminological confusion, there is general agreement on the major temporal units for the region as a whole. Disagreement continues, however, on dating of the transitions between temporal units (Warren and Crabtree 1986). The major differences between these chronological models are related to the timing of the onset of occupation in the region and the time depth of the earlier phases prior to 3200 B.P.

Although Wallace's (1962) early desert chronology is often used in overviews of the western Mojave, there is no detailed localized regional chronology for the western Mojave Desert or Antelope Valley in particular (yet see Norwood 1987 and Sutton 1988). The most prominent recent chronological framework variants for the Mojave Desert are those proposed by Warren (1980) and Bettinger and Taylor (1974) (Table 3.6-1). Warren's (1984) terminology provides the general framework in the following discussion, and alternative interpretations will be noted where appropriate.

Table 3.6-1

PROMINENT CHRONOLOGICAL SEQUENCES FOR THE MOJAVE DESERT

Warren (1984)	Bettinger and Taylor (1974)
Protohistoric (800 B.P.-Historic)	Marana (700 B.P.-Historic)
Saratoga Spring (1500-800 B.P.)	Haiwee (1400-700 B.P.)
Gypsum (4000-1440 B.P.)	Newberry (3200-1400 B.P.)
Pinto (7000-4000 B.P.)	Little Lake (6000-3200 B.P.)
Lake Mojave (12000-7000 B.P.)	Mojave (?-6000 B.P.)

3.6.4.1 Pleistocene Occupation

While there is no firm evidence of human occupation in the Mojave Desert prior to 10,000 B.P., the possibility has continued to intrigue a number of investigators (e.g., Davis et al. 1980). The currently accepted model is that humans first entered the western hemisphere between 12,000 and 25,000 B.P. The antiquity of human occupation in the New World, however, has been the subject of considerable hemisphere-wide debate over the last two decades, and a number of sites have been suggested to represent very early occupation of the Americas. Despite such intensive interest and a long history of research into

the early occupation of North America, no firm, widely accepted evidence dating prior to 15,000 B.P. has emerged. Such a situation, however, should not preclude the search for early man sites.

Pre-terminal Pleistocene occupation of the general Mojave region has been suggested based on the presence of weathered surface material typically characterized by a crude flaking technology. One of the most vocal and controversial proponents was the late Louis Leakey, who, at one time, proposed very early occupation at the Calico site situated to the southwest of Fort Irwin (Budinger 1983; Leakey et al. 1972). Other localities of proposed pre-terminal Pleistocene occupation include China Lake (Davis and Panlaqui 1978), Manic Lake and Coyote Gulch (Simpson 1958, 1961), and Manley Terrace (Clements and Clements 1953). Strong evidence that the objects recovered from these sites are manufactured by humans and that these objects indeed date prior to 12,000 B.P., or are directly associated with such Pleistocene deposits, is currently lacking (e.g., Haynes 1969; Jelinek 1992; Warren 1980). Certainly there are many portions of the Mojave Desert with exposed Pleistocene aged surfaces that would have been ideally suited for human occupation (Kaldenberg 1981). These surfaces, as well as related buried horizons, particularly around ancient lakes, are the most likely context in which earlier occupation may still be preserved.

3.6.4.2 Lake Mojave Period

The earliest accepted period of human occupation in the Mojave Desert is tentatively dated from about 12,000/10,000 to 7000 B.P. (Warren 1986). In southern California, this period has also been termed San Dieguito or Playa (Rogers 1939; Wallace 1977). The Lake Mojave cultural complex was originally distinguished at a series of sites occurring along the shorelines of ancient Lake Mojave that encompassed modern Soda Lake and Silver Lake. Absolute dates on stratified occupation horizons from this time period are infrequent, and the onset and termination of this period are conjecture.

The drying of these lakes no doubt had an effect on the distribution of resources and the organization of settlement patterns. At present, not enough fieldwork has been undertaken to characterize regional settlement systems for this period, but certainly recent results are providing the foundation upon which rigorous regional settlement and subsistence models can be built.

3.6.4.3 Pinto Period

This period is defined largely based on the presence of slightly shouldered, stemmed points with indented bases that are often lumped under the term Pinto (Warren 1984). Associated with these points are leaf-shaped bifaces, various unifacial tools including thick scrapers and core-cobble tools. Milling bases and handstones are also present. The type site for this period is the Pinto Basin site (Campbell and Campbell 1935). Pinto sites are relatively few in number and, except for the Stahl site (Harrington 1957), are typically surface manifestations or lack well-developed middens (Warren 1984:413, 1986:187). They are, however, situated throughout much of the Mojave Desert. A series of sites in the Salt Spring Hills area are assigned to the Pinto period (Campbell and Campbell 1937).

3.6.4.4 Gypsum Period

This period witnessed intensified occupation of the Mojave Desert correlated with new technological developments, a broadening of subsistence activities, and the development of new socioeconomic ties with the California coast and the Southwest. This more intensive occupation is reflected in the more abundant Gypsum period material at Rose Spring, Newberry Cave, Stuart Rockshelter, and Gypsum Cave (Clewlow et al. 1970; Lanning 1963; Shutler et al. 1960).

Overall, assemblages are quite diverse and reflect a generalized technology and mobile subsistence strategies. The hunting of large mammals (*artiodactyla*) appears to have been a significant aspect of Gypsum period subsistence, although other smaller faunal remains are well represented (McGuire and Hall 1988:319; Warren and Crabtree 1986:189). Initially, medium to large stemmed and notched points (including Gypsum Cave, Humbolt Concave Base, Elko Eared, and Elko Corner-notched styles) dominate assemblages, revealing the continued use of the dart and atlatl. These points are dated at a number of sites and appear to represent Great Basin influences (Warren and Crabtree 1986). Bifacially retouched cores, pressure flaking, and the use of microcrystalline material are widespread, the latter often being nonlocally available raw material (Basgall and Hall 1992). Casually retouched and edge-damaged pieces, typically produced on locally available raw material, are a major component of the assemblage.

Milling bases and manos (milling stone) are well-represented during the Gypsum period, indicating increased utilization of hard seeds. The ground stone artifacts are often small, portable, and formally diverse (Basgall and Hall 1992). The appearance of mortars and pestles has been interpreted as indicative of the onset of mesquite bean exploitation (Warren 1984:420). The relative proportions of milling and hunting equipment are quite similar to those in the ensuing Saratoga Springs period when plant exploitation became a major component of the subsistence system (Basgall et al. 1988:308; McGuire and Hall 1988:318).

Important changes in settlement also occurred. Large intensively occupied sites are located on the valley floors for the first time. Rogers (1939:61) suggested they may represent permanent habitation sites or at least areas that were repeatedly occupied over a long period of time. Wallace (1958:12) also observed the presence of large settlements occupied by a "fairly heavy, semisedentary population." Basgall and Hall, however, argue that Gypsum period sites on Fort Irwin were formed by repeated short stays by mobile hunter-gatherers. The Gypsum period also witnessed broader use of the landscape when canyon and upland areas were exploited (Lyneis 1982:177).

Late in the period, the stylistically similar but smaller Rose Spring series points are introduced, indicating the introduction of the bow and arrow. This development apparently is temporally associated with the introduction of a hunting ritual associated with split-twig figurines and petroglyphs in the Coso Mountains.

3.6.4.5 Late Prehistoric Period

This time unit encompasses the Saratoga Springs and Shoshonean periods of Warren (1984) and is characterized by cultural divergence and increased regional variance within the Mojave Desert. Moreover, external influence, and probably occupation, by Anasazi from the Virgin area and Patayan from the Colorado River is hypothesized (Warren 1984:420,424; Warren and Crabtree 1986:191). Smaller Rose Spring and Cottonwood Triangular projectile points predominate and were used with the bow and arrow. Metates (hand stone), manos (milling stone), mortars, pestles, ceramics, and a variety of ornamental and ritual objects are a regular part of the cultural inventory.

The presence of large "village" sites, such as the Bickel site in the western Mojave (McGuire et al. 1981), Saratoga Spring in Death Valley (Wallace and Taylor 1959), and Oro Grande on the Mojave River (Rector et al. 1983), are first documented during this period. The settlement organization appears to shift from circulating to radiating in these areas, with temporary camps and processing stations situated around major habitation units (McGuire and Hall 1988:320). The more specialized site types are distinguished from habitation sites by their smaller artifact distributions and densities, and the types of activities performed. Tool finishing and associated residue are more often recovered in habitation contexts, whereas lithic reduction at smaller field camps was more expedient, emphasizing the production of flakes for immediate tasks (McGuire and Hall 1988:323).

3.6.4.6 Protohistoric Period

The ethnohistory of the central Mojave is poorly understood due to the lack of ancestry surviving into the twentieth century (Knack 1980; Kroeber 1925). Kroeber (1925) suggested that the southern Paiute inhabited the region that includes the study area, with the Kawaisu situated to the west and the Serrano (Vanyume) to the south. These groups of the Uto-Aztecan language family were closely aligned linguistically and culturally to other Great Basin Shoshonean groups who typically spoke Numic languages (Warren 1984:344). Population densities were considered to have been low, and seasonal occupation typified the exploitation pattern. The southern Paiutes appear to have had population centers in the lower Amargosa Valley and the Kingston Mountains east of the study area (Kroeber 1925:594-595).

3.6.4.7 Historic Period

Two extensive summaries of known historic resources within the project area have been undertaken by Jackson et al. (1987) and Jackson, Herbert, and Wee (1987) for the proposed Fort Irwin land expansion. The study conducted by BFM in 1993 included a record and literature search in addition to survey identification of sites within the Silurian Valley area (Byrd and Pallette 1994).

A total of 192 historic sites and nine additional sites with historic components have been recorded in the area. These sites have been categorized (Jackson et al. 1987; Jackson, Herbert, and Wee 1987) according to general land use, including exploration and transportation (1829-present), mining (1860-present), agriculture and homesteading (1860-present), and military (1860-1871 and 1940 to present).

While these behavioral configurations reflect diverse forms of resource use and exploitation, all are constrained by the abundance and distribution of water. Types and locations of springs, the success of wells, and the regularity of flows determined road directions and the locations of homesteads and mines.

Road construction had an early beginning in this part of the Mojave Desert, originating with early exploration parties and the Mormon passage into southern California. Later growth in the mining industry, coupled with limited agricultural development, generated needs for additional access and distribution routes, ultimately leading to the presence of nine different corridors in the project area.

Mining activities within the project area started in the 1860s, with the first important surge of development occurring with the discovery of gold in the Alvord Mountains in the 1880s. Later, the Coolgardie, Paradise, and Goldstone districts experienced considerable growth from 1892-1910, and there was a general increase from 1916-1918. Production subsequently became more dormant in the 1920s, and during 1933-1934, as gold prices and depression-generated unemployment spiraled upward, mining and prospecting again experienced an influx.

Agriculture development and homesteading in the project area were extensions of a growth trend occurring throughout the desert regions of California. Major improvement of water resources in 1914 allowed development of orchards, grain agriculture, and truck farming. By the 1920s, however, agriculture was recognized as a futile enterprise due to marginal water supplies, and residents began to abandon their farms and homesteads. Sheep and cattle grazing was practiced as an alternative, but that was limited to particular seasons in favorable years.

Military use of the region is restricted to two periods of time, 1860-1871, and 1940-present. The initial 11-year period is associated with the establishment of Camp Cady, an outpost to protect interests and populations in the region. This facility was just outside the project's southeastern boundary, within the Mojave River valley. After abandonment in 1871, the structures were occupied by local ranchers.

In 1940, lands roughly corresponding to what is now Fort Irwin were requisitioned by the Federal Government for an anti-aircraft gunnery range. Use of the camp became more intensive with the development of desert warfare in World War II but was deactivated at the conclusion of fighting in North Africa in 1944. With the start of the Korean War in 1951, use of the camp resumed and was permanently established in 1961. Ten years later, the post was placed on maintenance status, and in 1980 the fort was designated the National Training Center.

3.7 PALEONTOLOGY

Fossiliferous sediments in the study area date from the Triassic through the Pleistocene, from about 200 million to about 9,000 years ago. Most of the important fossil-bearing sediments were deposited during the Cenozoic Era, which is divided into two periods: the Tertiary (66 to 1.6 million years ago) and the Quaternary (1.6 million years ago to recent times). The Quaternary period is further divided into two epochs: the Pleistocene (1.6 million to 10,000 years ago) and the Recent or Holocene. The Tertiary period is well represented in the study area, as is the Quaternary. Twenty-one million years of Tertiary history are recorded in the sediments deposited in the basins created during that time as a result of crustal deformation related to activities along the San Andreas and Garlock Faults.

The Quaternary was characterized by period advances and retreats of continental ice sheets that influenced worldwide changes in temperature, moisture, air movements, and sea levels, leading to changing floral and animal distribution and the evolution and extinction of life forms.

The Pleistocene is divided into three land mammal ages: the Blancan, the Irvingtonian, and the Rancholabrean. The presence of Pleistocene fossils offers important data about paleoenvironmental changes and biostratigraphic correlations during the last epoch.

A literature and records search was completed for the study area by Robert E. Reynolds, Curator, Earth Sciences, San Bernardino County Museum. The records and literature search identified a number of potentially sensitive fossiliferous areas within the study area. These include portions of the Soda Mountains, the Mud Hills, the Alvord Mountains, or Coyote Lake, Day Wash, Bitter Springs Wash, Red Pass Lake, and Superior Lake sediments.

Of the important fossil-bearing formations, the Barstow Formation with its high potential for yielding fossils is the most widely distributed. The Avawatz, Pickhandle, and Jackhammer Formations, while less extensive, also have the potential for yielding important vertebrate fossils: the Avawatz fossils of Pliocene age, and the Pickhandle and Jackhammer of Miocene age. The Moenkopi/limestone and the Aztec sandstone formations found in the Soda Mountains have the potential of yielding fossils dating to the early Triassic and Jurassic.

In addition to fossil-bearing formations, a number of basin sediment and gravel deposits have been identified that have yielded or could potentially yield important Pliocene and Pleistocene fossils. These include North Soda Mountains Tc, volcanic and granitic gravels of the Alvord Mountains, Bitter Springs QP, Red Pass Lake outflow sediments, Avawatz QP, Superior Valley sediments, Coolgardie sediments, Paradise Springs silts and tufa, Coyote Basin and Coyote Lake sediments, Silver Lake Road sediments, and Red Pass Lake sediments.

Evaluation of the paleontological resource within the Silurian Valley study area was conducted by Robert Reynolds of the San Bernardino County Museum. The initial investigations have identified paleontologically sensitive Paleozoic, Proterozoic, and Cenozoic sediments and informations.

Paleozoic and Proterozoic marine metasedimentary rock units of the Avawatz Mountains include the Johnnies and Carrara formations.

- Johnnie Formation: Pre-Cambrian sediments of the Johnnie Formation contain the oldest known mitosing cells in the world. They are known to occur in the vicinity of Kingston Peak. It should be determined if they occur in the Avawatz Mountains before the area is incorporated into the military reservation.

- Carrara Formation: Known to contain fossil invertebrates, such as trilobites, elsewhere in eastern San Bernardino County and southern Nevada.

Cenozoic continental sedimentary units occurring within study area include Avawatz Formation, Military Canyon Formation, Silurian Valley, Silver Lake Playa, and Salt Spring Playa.

- Avawatz Formation: Within the study area, Miocene sediments of this formation have produced Clarendonian Land Mammal Age fossils, such as *Pliohippus* (Miocene horse) and *Gomphotherium* (mastodon).

- Military Canyon Formation: Located in the Noble Hills area as well as Military Canyon of the norther Avawatz Mountains; these siltstones

and sandstones have produced trackways of camel and protoceratid. The protoceratid indicates a latest Clarendonian earliest Hemphillian Land Mammal Age.

- Silurian Valley: Late Pleistocene fluviatile sediments of the Mojave River have produced fossil remains of land mammals. These include sediments on the northwest shoreline of Silver Lake.

- Silver Lake Playa: Lacustrine sediments from Silver Lake have produced abundant gastropods and lelecypod (*Anodonta californiensis*) shells, as well as fish and land mammals from late Pleistocene to early Holocene.

- Salt Spring Playa: Late Pleistocene pinkish efflorescent sediments at the southeastern base of the Salt Spring Hills, interbedding with lacustrine sediments of Salt Spring Playa, have produced fossil mammoth, camel, and birds. The lacustrine sediments of Salt Spring Play and Silver Lake Playa correlate to Silurian Lake and the unnamed playa sediments; therefore, the latter two have potential to contain vertebrate paleontologic resources.

Paleontological investigations have been conducted in the Silurian Valley area, but further judgmental survey is needed to better refine the distribution of specific sensitivity areas. Robert E. Reynolds, Curator of Earth Sciences, San Bernardino County Museum, has been contracted to develop a paleontologic resource and sensitivity report for the Silurian Valley study area. The final report will include a geological overview, paleontological records search, judgmental field examination of portions of the study area, and development of a set of paleontological sensitivity maps on USGS quadrangles.

3.8 AIR QUALITY

3.8.1 Meteorological and Climatic Conditions

The climate of the study area is characterized by hot summers, mild winters, infrequent rainfall, moderate afternoon breezes, and generally fair weather. Regional winds are primarily influenced by the Sierra Nevada and Transverse Mountain ranges, the distance inland from coastal northwest winds, and the inland winds that flow across the high desert plains from the Los Angeles Basin. Regional winds are typically from the southwest with a yearly average speed of about 10 mph. Winds blowing across State Highway 127, in the eastern portion of the study area, show dominant airflow to the east (U.S. Amry Corps of Engineers [Corps] 1991). A Fort Irwin wind rose is presented on Figure 3.8-1. Dust generated from existing NTC off-road soil disturbance normally parallels I-15 and passes north of Baker. This results in the tendency of NTC activity emissions to parallel I-15. Figure 3.8-2 presents a wind rose from Silver Lake, which is immediately south of the Silurian Valley.

When regional winds are low to calm, local winds in the valleys among the Avawatz, Alvord, Calico, Granite, and Soda Mountains will occur. Local winds in the valleys are generated by differential heating and cooling of the air in the complex mountain terrain. Radiative cooling of the slopes during the night and early morning hours causes air close to the ground to cool and become denser. As the air becomes more dense, it drains down the predominant water courses producing downslope/valley drainage winds. After sunrise, solar radiation warms the ground and the air above rises, reversing the flow by late afternoon and producing upslope/valley winds. This local generation of winds is further complicated by temporal and seasonal differences in sunrise/sunset times due to slope steepness, topographic shading, and orientation (aspect). Depressed areas, such as the many local dry lakes and valleys, allow air drainage pooling to occur at night and early morning. During the night and early morning in the study area, local winds are light, proceeding down the slopes of the ridges of the local mountains. Stronger afternoon upslope/valley winds draw air through the local basin areas.

Furthermore, winds may be shifted to fit local topographical constraints. Regional wind patterns analyzed during the multiagency RESOLVE (Research on Operations Limiting Visual Extinction) Project indicate that the areas east of NTC are often affected by the Mojave Desert convergence zone that sometimes shifts westward far enough to allow Imperial Valley emissions to affect the region east of the NTC (NAWS 1988). The south-to-north component in an area of channeled topography suggests that, while airflow is typically to the east, some component may move south to north toward the Death Valley National Park.

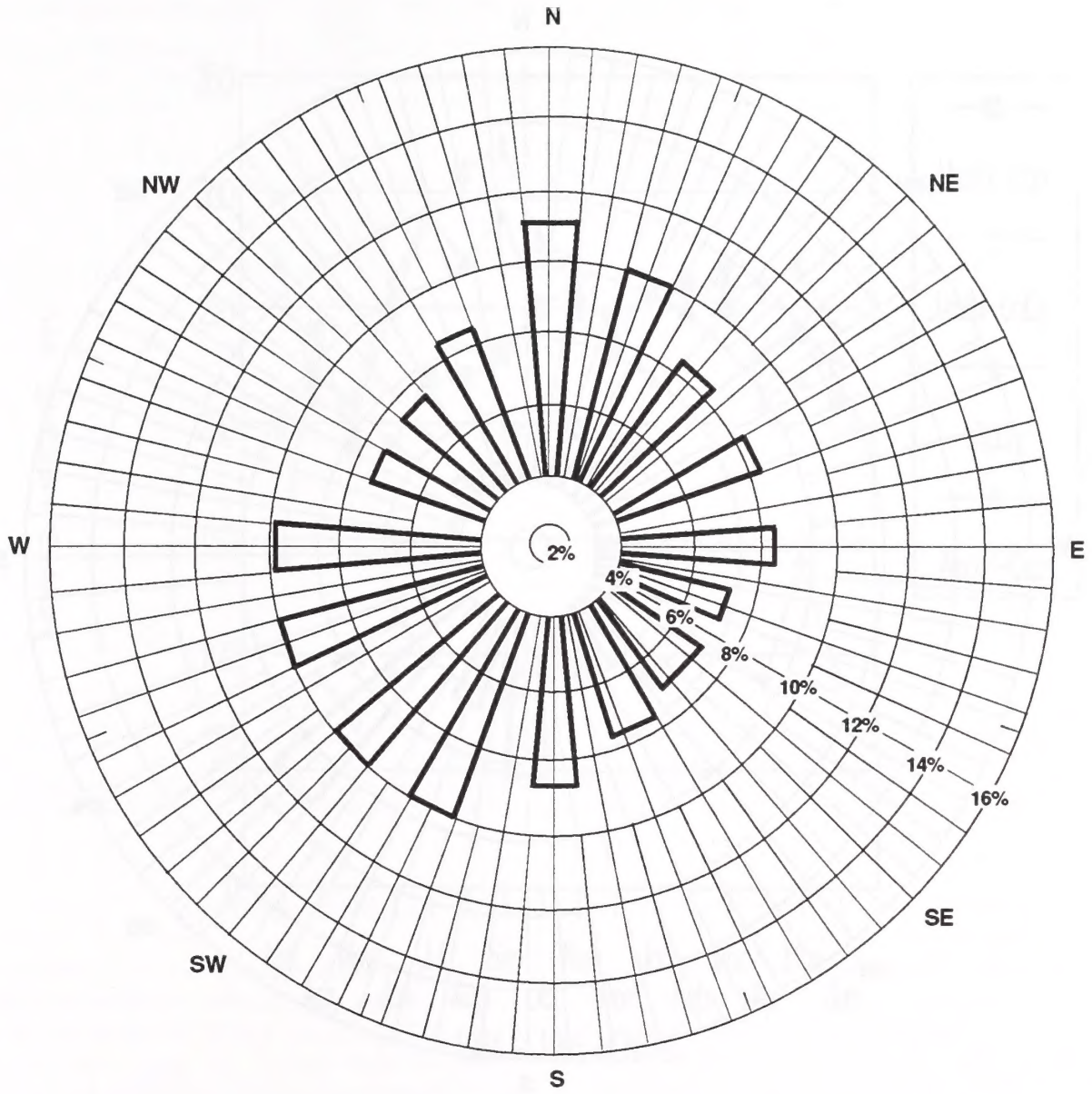
Another aspect of potential air pollutant dispersion patterns involves the mixing height of the atmosphere. The height of the mixed layer above the Southern California Edison Cool Water Coal Gasification Plant, located approximately 15 miles south of the study area at its nearest point, has been monitored using acoustic sounders operated by Radian (HVR 1989, Technical Appendix L). The lowest stable mixing height was measured at 656 feet (200 m) (Figure 3.8-3).

Monthly mean temperatures in the study area, as determined from long-term climatic data at the Barstow/Daggett Airport and Bicycle Lake AASF, range from 48 to 89°F with a maximum mean of 104°F and a minimum mean of 36°F (Table 3.8-1).

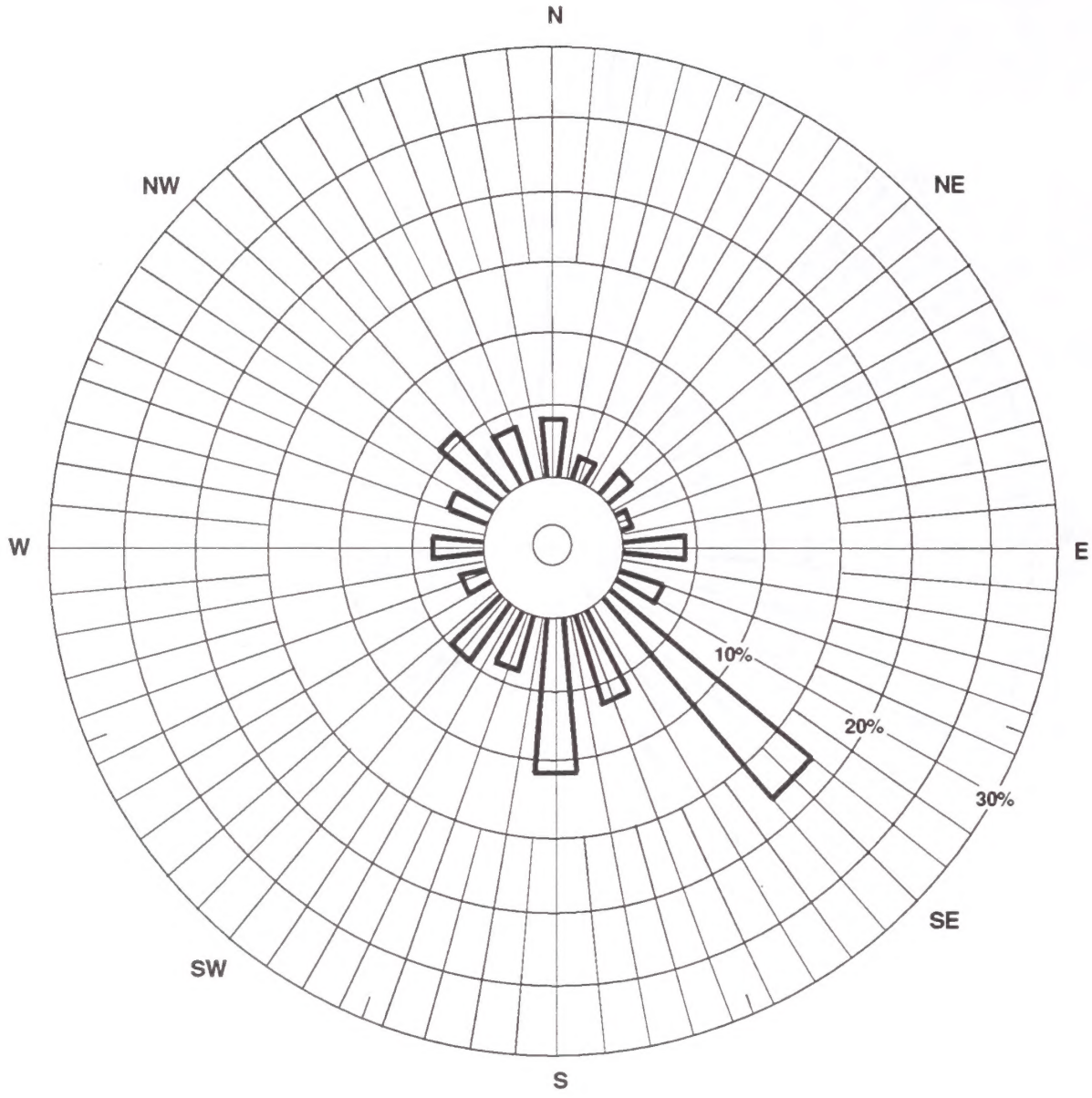
Rainfall in the study area varies considerably in both time and space. Almost all of the annual rainfall comes from the fringes of midlatitude storms from August to April with summers often completely dry except for occasional widely scattered thundershowers. Rainfall averages approximately 3.9 inches per year. Relative humidity is typical of the high southeast Mojave Desert area and is low in the summer (except during infrequent rain storms). Mean monthly relative humidity ranged from a high of 54 percent in January to a low of 22 percent in June (MBA 1991). Mean annual pan evaporation in the study area is estimated at over 140 inches per year (HVR 1989, Technical Appendix D).

3.8.2 Air Quality Standards

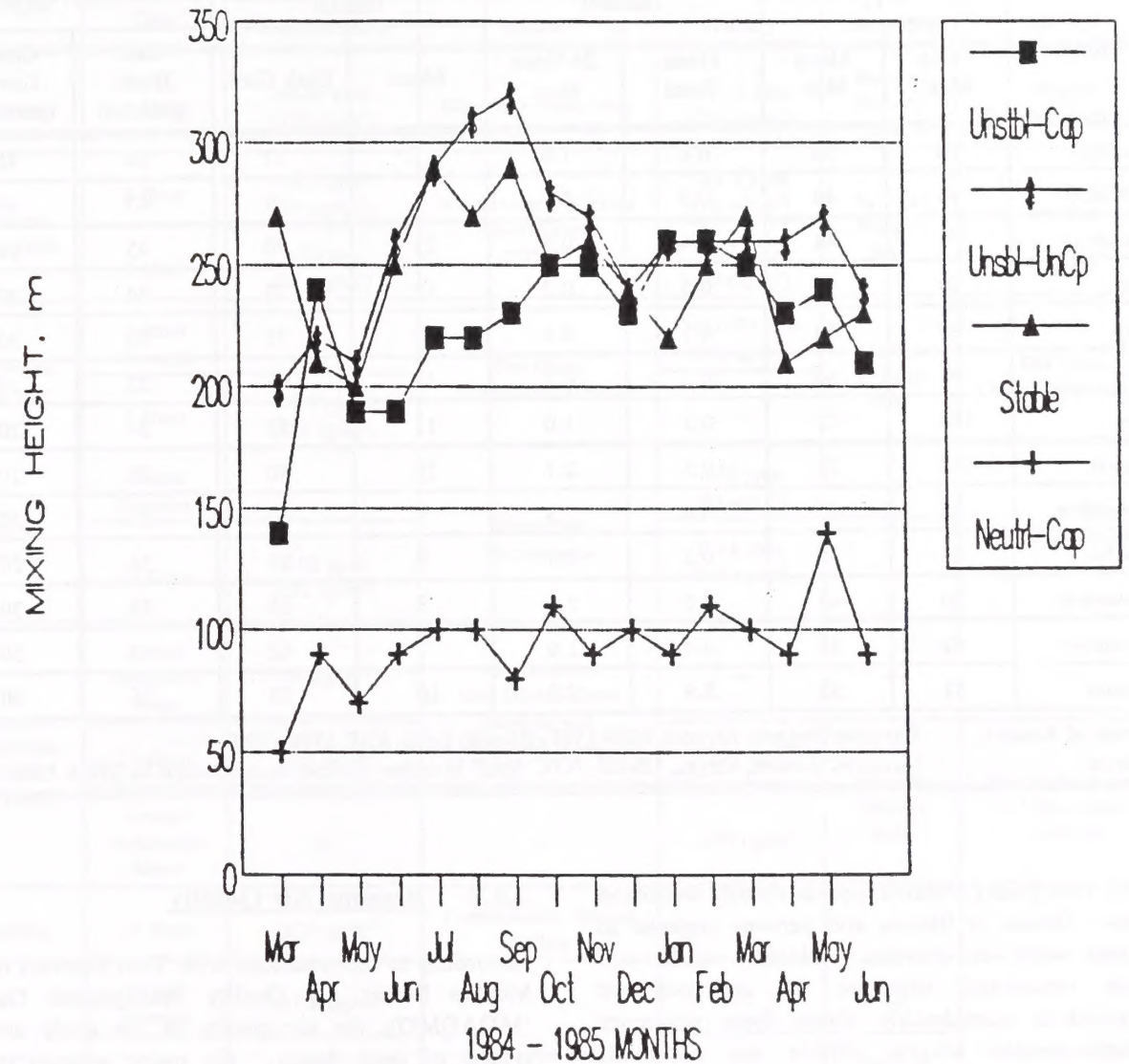
Air quality impacts of a proposed project, combined with existing background air quality levels, must be compared to the applicable ambient air quality standards (AAQS) in order to gauge their significance. These standards are the levels of air quality considered safe, with an adequate margin of safety, to protect the public health and welfare. They are designed to protect those "sensitive receptors" most susceptible to further respiratory distress, such as asthmatics, the



FORT IRWIN WIND ROSE
Figure 3.8-1



SILVER LAKE WIND ROSE
Figure 3.8-2



SOURCE: Cool Water Coal Gasification facility

MIXING HEIGHT BY TYPE, COOL WATER DAGGETT, CA
Figure 3.8-3

Table 3.8-1

CLIMATIC AVERAGES OF FORT IRWIN NTC

Month	Temperatures (°F)		PPT (inches)		Wind (knots)		Humidity/Clouds	
	Mean Max.	Mean Min.	Mean Total	24-Hour Max.	Mean	Peak Gust	Rel. Hum. (percent)	Cloud Cover (percent)
January	60	36	0.6	1.0	7	67	54	40
February	66	40	0.3	0.7	8	69	47	40
March	71	44	0.4	0.9	11	70	45	30
April	79	50	0.3	0.7	12	73	34	30
May	87	58	0.1	0.4	12	71	30	30
June	98	66	0.1	0.5	12	67	22	10
July	104	73	0.3	1.0	11	52	24	20
August	102	72	0.5	2.1	10	50	28	10
September	95	65	0.4	2.3	9	60	32	10
October	83	55	0.2	0.7	9	59	34	20
November	70	43	0.3	1.1	8	58	38	30
December	62	36	0.4	1.0	7	62	42	30
Annual	**81**	**53**	**3.9**	**2.3**	**10**	**73**	**36**	**30**
Period of Record:	**Barstow/Daggett Airport 1949-1981; Bicycle Lake AAF 1986-1990**							
Source:	**Lance S. Jensen, Capt., USAF, NTC Staff Weather Officer as contained in MBA 1991**							

elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed. Because California already had standards in existence before federal AAQS were established and because of differences of opinion by medical panels established by the California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (EPA) on pollutant levels that protect susceptible members of the population from adverse health impacts with an adequate degree of safety, considerable diversity exists between state and federal standards currently in effect in California as shown in Table 3.8-2. Note that where state standards duplicate federal standards, the state standards are more stringent in all cases.

3.8.3 Baseline Air Quality

According to conversations with Tom Guevera of the Mojave Desert Air Quality Management District (MDAQMD), the air quality in the study area is typical of open desert. No major sources of air pollutants are located in the area, and the air quality is dominated by air pollution transported from the Los Angeles Basin and particulate matter from desert wind storms. Existing levels of ambient air quality and historical trends and projections in the study area are best documented by measurements made by the MDAQMD at its Barstow air monitoring station located approximately 20 miles south and at the Trona Station located approximately 30 miles northwest, both as measured at their nearest points to the study area. Additionally, PM-10 (particulate matter with an aerodynamic diameter less than 10 microns) data from the Mojave station located about 100 miles to the west

Table 3.8-2

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards		Federal Standards		
		Concentration	Method	Primary	Secondary	Method
Ozone	1 Hour	>0.09 ppm (180 ug/m³)	Ultraviolet Photometry	>0.12 ppm (235 ug/m³)	Same as Primary Std.	Ethylene Chemiluminescence
Carbon Monoxide	8 Hour	>9.1 ppm (10 mg/m³)	Nondispersive Infrared Spectroscopy (NDIR)	≥9.5 ppm (10 mg/m³)	Same as Primary Stds.	Non-dispersive Infrared Spectroscopy (NDIR)
	1 Hour	>20 ppm (23 mg/m³)		>35 ppm (40 mg/m³)		
Nitrogen Dioxide	Annual Average	---	Gas Phase Chemiluminescence	>0.0534 ppm (100 ug/m³)	Same as Primary Std.	Gas Phase Chemiluminescence
	1 Hour	>0.25 ppm (470 ug/m³)		---		
Sulfur Dioxide	Annual Average	---	Ultraviolet Fluorescence	0.03 ppm (80 ug/m³)	---	Pararosoaniline
	24 Hour	0.05 ppm (131 ug/m³)		0.14 ppm (365 ug/m³)	---	
Suspended Particulate Matter (PM-10)	Annual Geometric Mean	30 ug/m³	Size Selective Inlet High Volume Sampler and Gravimetric Analysis	---	---	---
	24 Hour	>50 ug/m³		>150 ug/m³	Same as Primary Stds.	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	---	---	>50 ug/m³		
Sulfates	24 Hour	≥25 ug/m³	Turbidimetric Barium Sulfate	---	---	---
Lead	30 Day Average	≥1.5 ug/m³	Atomic Absorption	---	---	Atomic Absorption
	Calendar Quarter	---		≥1.5 ug/m³	Same as Primary Std.	
Visibility Reducing Particles	1 Observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70 percent		---	---	---

*** Prepared in accordance with applicable SCAQMD Air Quality Data Cards and ARB Fact Sheet 38 (revised 7/88).**

have been included in this area and are considered fairly representative of the desert environment without substantial urban development (Table 3.8-3). The data for gaseous emissions probably overestimate site conditions because the site is remotely located away from any population centers. The nearest city, Baker, is approximately 7 miles to the south from the extreme southeasterly edge of the study area, and Barstow is approximately 30 miles south from the southwest edge of the site.

Data from the Barstow monitoring station show the inland transport of air pollutants from the Los Angeles Basin area. Monitored air pollutants include ozone (O_3), carbon monoxide (CO), nitrogen oxides (NOx), and several types of airborne and suspended particulates, such as total dust and sulfates. These measurements show that photochemical smog levels (mainly ozone) have exceeded the California Ambient Air Quality Standard's (CAAQS) 1-hour average of 0.09 ppm every year for the 5-year period from 1990 to 1994 with levels holding fairly steady since 1990. CO, on the other hand, shows no exceedances over the 5-year period, with peak levels showing a slight decrease in recent years. Nitrogen dioxide (NO_2) has shown one exceedance of the standard at the Trona Station in the 5-year period. While peak levels have been fairly steady at the Barstow Station, they showed a marked increase at the Trona Station until 1994 when they were substantially reduced. Monitored airborne particulate levels show that the 50-microgram-per-cubic-meter (ug/m^3) 24-hour average CAAQS for PM-10 particulates (particulate matter that is less than 10 microns, or 0.0004 inch in diameter) was exceeded several times each year for the 5 years presented, but shows a downward trend in the number of exceedances. Airborne particulate exceedances are strongly correlated with the frequency of desert wind storms (HVR 1989, Technical Appendix L). The data suggest that the gaseous air quality problems present in the monitored areas are mainly due to the transport of pollutants into the area from outside sources. The study area, being further removed from major metropolitan centers, would be expected to exhibit even lower concentrations of exhaust pollutants, but total suspended particulates (TSP) and PM-10, being mainly the products of windblown dust and physical disturbance, could be very similar to the monitored values.

3.8.3.1 Nonattainment Areas

A desert surface with limited plant life that reduces near-surface winds gradually evolves into an aerodynamically stable configuration that is resistant to erosion. This condition is commonly known as "desert pavement." If the crust is broken, turbulent eddies will form that cause subsurface clays and silts to be injected into the air. Such disturbance is often the result of mechanical interaction between tires or treads of vehicles and the surface. Based on travel speed, the depth of the trailing vortex may be 20 to 30 feet.

At night, the normally calm air and low-level radiation inversion keep the dust confined to a shallow layer, and the heavier dust particles soon settle out gravimetrically. During the day, however, the absorption of solar energy creates eddies as hot air rises from the surface and cool air sinks from aloft. The vertical mixing dilutes the dust cloud, but the initial dust loading is often so high that the entire dust column remains as visible evidence of the mixing process. Soil disturbance by OHVs leads to dust clouds that extend into the air over the activity. With a settling velocity of only a few feet per minute for the smaller particles and continued thermal stirring, the cloud may persist for several hours after the disturbance activity ceases.

The disturbed surface may take years to repair itself. During that repair, strong winds blowing from north to south during post-frontal storm weather and during Santa Ana conditions will continue to extract fine material from the disturbed area, further contributing to PM-10 loadings.

According to Tom Guevara of the MDAQMD (October 7, 1992), the southwest portion of Fort Irwin is in nonattainment of both the federal and state standards for ozone; however, the eastern portion and Silurian Valley are in attainment of the federal ozone standard (though not the state standard). Furthermore, with regard to PM-10, the entire Basin is in nonattainment of the state and federal PM-10 standard as of January 1994. The Trona area is also in nonattainment for hydrogen sulfide (H_2S); however, the study area is far enough removed from this area such that H_2S is not considered a problem and the area is in attainment of the H_2S standard.

The MDAQMD would like to be designated as attainment but cannot be because of the large geographic and generally unpopulated area east of the

Table 3.8-3

EXCEEDANCE OF AIR QUALITY STANDARDS FOR THE BARSTOW, TRONA, AND MOJAVE AIR MONITORING STATIONS[1]

Pollutant/Standard	1990	1991	1992	1993	1994
Ozone					
Number of Days Exceeding Ozone State 1-hour > 0.09 ppm	35	15	30	28	24
	3	6	3	5	3
Number of Days Exceeding Ozone Federal 1-hour > 0.12 ppm	1	2	1	1	1
	0	0	0	0	0
Ozone Max. 1-hour conc. (ppm)	0.13	0.13	0.13	0.13	0.13
	0.11	0.12	0.10	0.10	0.10
Carbon Monoxide					
Number of Days Exceeding Carbon Monoxide Federal 8-hour $\geq$ 9.5 ppm	0	0	0	0	0
	NM	NM	NM	0	0
Number of Days Exceeding Carbon Monoxide Federal 1-hour > 35 ppm	0	0	0	0	0
	NM	NM	NM	0	0
Number of Days Exceeding Carbon Monoxide State 8-hour $\geq$ 9.1 ppm	0	0	0	0	0
	NM	NM	NM	0	0
Number of Days Exceeding Carbon Monoxide State 1-hour > 20 ppm	0	0	0	0	0
	NM	NM	NM	0	0
Carbon Monoxide Max. 1-hour conc. (ppm)	5	5	6	5	4
	NM	NM	NM	2	2
Carbon Monoxide Max. 8-hour conc. (ppm)	3.9	3.6	3.4	2.7	2.7
	NM	NM	NM	2.0	2.0
Nitrogen Dioxide					
Number of Days Exceeding Nitrogen Dioxide State 1-hour > 0.25 ppm	0	0	0	0	0
	0	0	0	1	0
Nitrogen Dioxide Max. 1-hour conc. (ppm)	0.14	0.10	0.10	0.11	0.14
	0.19	0.25	0.24	0.36	0.04
Sulfur Dioxide					
Number of Days Exceeding Sulfur Dioxide State 1-hour > 0.25 ppm	NM	NM	NM	NM	0
	0	0	0	0	0
Sulfur Dioxide Max. 1-hour conc. (ppm)	NM	NM	NM	NM	0.07
	0.05	0.03	0.03	0.03	0.01

Table 3.8-3

EXCEEDANCE OF AIR QUALITY STANDARDS FOR THE BARSTOW, TRONA, AND MOJAVE AIR MONITORING STATIONS[1]

Pollutant/Standard	1990	1991	1992	1993	1994
Suspended Particulate Matter					
Total Suspended Particulates Max. 24-hour conc. (ug/m^3)	NM	NM	NM	NM	NM
	686	294	202	96	254
Particulate Sulfate > 10 microns Percent Samples Exceeding State 24-hour ug/m^3	0	0	0	0	0
	0	0	0	0	1
Particulate Sulfate > 10 microns Max. 24-hour conc. (ug/m^3)	7.3	5.2	9.3	5.6	4.2
	16.2	11.1	7.5	5.2	20.6
Inhalable Particulates (PM-10) Percent Samples Exceeding State 24-hour Standard	27	8	12	0	2
	31	18	17	21	20
	9	7	3	0	0
Inhalable Particulates (PM-10) Percent Samples Exceeding Federal 24-hour Standard	2	2	0	0	0
	2	0	0	0	0
	2	0	0	0	0
Inhalable Particulates (PM-10) Max. 24-hour conc. (ug/m^3)	381	197	68	49	140
	366	114	105	79	107
	492	103	65	43	33

[1] Upper and lower values represent the Barstow and Trona Air Monitoring Stations, respectively. For inhalable particulates only, the third value represents the Mojave Air Monitoring Station.
[2] NM - Not monitored.

Source: Air Quality Data. CARB, 1990, 1991, 1992, 1993, and 1994

Victorville urban area. This large area includes Fort Irwin and Twentynine Palms. Carving the large geographic area away from the urbanized areas would allow the MDAQMD to concentrate on anthropogenic emissions.

Both the Assembly Bill 2595 (also known as the California Clean Air Act or CCAA of 1988) and the Federal Clean Air Act Amendments of 1990 require that nonattainment areas develop plans for attaining these standards by no later than 2010. The requirements and deadlines differ as to the severity of the pollution within the basin. Thus, the MDAQMD "Final 1991 Air Quality Attainment Plan" (MDAQMD 1991) was drafted. Subsequent to federal designation of San Bernardino County as nonattainment for PM-10 in December 1993, a State Implementation Plan (SIP) was developed for the southwestern quarter of San Bernardino County, which includes the southern portion of the expansion planning area, and forwarded to EPA in July 1995. Other areas of the County, including the existing Fort Irwin base, have been proposed for exclusion from the nonattainment area. Fort Irwin and Twentynine Palms are currently conducting facility perimeter monitoring and dispersion modeling to determine their relative emissions. Based on the results of this data collection, the need for further action by MDAQMD and CARB will be evaluated.

The Federal Clean Air Act does not require PM-10 plans for all federally designated nonattainment areas. Areas determined to have serious PM-10 problems are expected to attain this federal standard by no later than December 31, 2002. Extensions and waivers may be granted on a case-by-case basis for areas where the data for PM-10 are incomplete and precursor sources of PM-10, such as sulfates and nitrates, comprise a relatively small portion of PM-10 emissions in the area. Although the urbanization of the South East Desert Air Basin (SEDAB) does make some contribution to the local PM-10 problem, the major source of this material is from fugitive dust that is generated locally from sources such as travel on unpaved roads. Windblown erosion from roads, lakebeds, and disturbed areas is also a significant PM-10 source. About 7 percent of the PM-10 emissions are believed by the MDAQMD (Final SIP July 1995) to be the result of transport from other air basins, primarily from the South Coast Basin, which includes the Los Angeles and San Bernardino areas. Sources include soil disturbance and desert meteorological conditions (wind, desert soils, and lack of moisture).

The study area, receiving little ground-based activity, has comparatively low particulate levels, similar to those in Death Valley. In areas of extensive human activity or downwind from urban population centers or in areas of extensive soil disturbance related to mineral resource extraction and processing such as Trona, background dust levels were two to four times higher than in less disturbed areas, such as the study area. Particulate monitoring by the National Park Service at Death Valley National Park in the early to mid-1980s showed little year-to-year variation in either large or small diameter particulate loading potentially related to the ongoing desert maneuver activities at the NTC.

Existing PM-10 levels stem mainly from windblown dust resulting from construction activity, wind erosion of unpaved roads, and wind erosion of disturbed surface areas of the cities and the County. Smaller quantities of PM-10 (about 7 percent of the total) are carried over from the South Coast Air Basin (SCAB). These include aerosols, fumes, and mists resulting from secondary reactions in the atmosphere. The SCAB generates a high percentage of very fine particulates through these secondary airborne chemical reactions of pollutants that are gaseous by origin. These very fine particles remain suspended in the air for some distance.

Heavy particles created either through man's actions or from strong wind abrasion on the terrain settle out of the air in proximity to their source. However, in accordance with AP-42 (EPA 1985), approximately 36 percent of the dust raised through soil displacement consists of PM-10 (particulates smaller than 10 microns in diameter). AP-42 also estimates that grading and other soil disturbance activities may contribute 1.2 tons per month (110 pounds per day) of total suspended particulates (TSP or PM-30) per acre disturbed. Thus, based on a 36-percent content of PM-10, each acre disturbed could add 40 pounds a day of PM-10 material.

Unlike gaseous and PM-10 emissions that can be readily transported over miles through minor wind action, TSP and visibility measurements vary over short distances as a direct function of nearby soil disturbance. Particulate and visibility measurements were taken at Fort Irwin and in Death Valley in 1980 and 1981 by the U.S. Army Environmental Hygiene Agency (USAEHA 1982) and Fort Irwin now takes these measurements on a continuous basis. The ratios of average and peak total suspended particulate loading at Barstow, Trona, and Death Valley compared to Fort Irwin at T.V. Hill are presented in Table 3.8-4.

Table 3.8-4

AVERAGE AND PEAK TSP LOADING DURING NTC REACTIVATION (1980-81)

Location	Average Value (ug/m^3)	Average TSP Ratio to NTC	Peak (ug/m^3)	Peak TSP Ratio to NTC
Fort Irwin (T.V. Hill)	32	---	108	---
Death Valley (Nevares Spring)	26	0.81	169	1.56
Barstow (APCD)	80	2.5	224	2.07
Trona (APCD)	142	4.44	369	3.42
APCD = Air Pollution Control District				

Table 3.8-5

COMPARATIVE PM-10 AND TSP MEASUREMENTS BETWEEN A LOCAL WIND-BLOWN, FUGITIVE DUST-DOMINATED STATION (TRONA) AND A REGIONAL, TRANSPORTED, LOWER VISIBILITY-DOMINATED STATION (BARSTOW)

Season	PM-10 (ug/m^3)		TSP (ug/m^3)		PM-10/TSP (percent)	
	Barstow	Trona	Barstow	Trona	Barstow	Trona
Winter	27.0	47.2	50.1	125.8	54	38
Spring	45.6	49.1	72.3	81.3	63	60
Summer	40.8	41.7	72.1	88.2	57	47
Fall	31.2	44.1	54.8	134.3	57	33
Annual	36.2	45.5	62.3	107.4	58	42
Source: CARB 1986-87, in MBA 1991						

(Rolands 1980). The smallest particles from this soil disturbance can remain suspended in the air for miles, but the visible plume usually dissipates within a short distance unless heavy winds are present to keep the larger particles in suspension.

Intrusion of small diameter particles as a degradation factor to visibility into the Mojave Desert is seasonably dependent. Table 3.8-5 compares the seasonal distribution of PM-10 and TSP at Barstow and Trona. An increase occurs in particulate levels in Barstow in the spring and summer as the daily onshore air flow increases, the sun intensifies pollutants created in the SCAB, and stronger inversions more effectively trap the pollutants before they escape into the upper desert. In Trona, the PM-10 fraction remains stable throughout the year, while the large particle fraction drops during the warm season. Visibility declines in the spring and summer as the periphery of the SCAB's haze reaches the Fort Irwin area.

3.9 NOISE

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. The decibel (dB) scale is used to quantify sound intensity. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Because the human ear is not equally sensitive to all frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called "A-weighting" written as dBA. Human hearing can detect changes in sound levels of approximately 3 dBA under quiet conditions. Changes of less than 3 dBA are only discernable under controlled, extremely quiet conditions. "C-weighted" noise is typically associated with noise-producers that emit the majority of their noise energy into the infrasonic region. This includes noises such as cannon fire, sonic booms, and the noise generated by the use of heavy vehicles such as tanks. This noise is typically felt, as well as heard, and is responsible for the vibrations that shake windows and buildings.

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called Leq), or alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law and the County of San Bernardino require that, for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL) or Day-Night Noise Level (Ldn). The CNEL descriptor requires that an artificial increment of 5 dBA be added to the actual noise level for the hours from 7:00 to 10:00 p.m. and 10 dBA for the hours from 10:00 p.m. to 7:00 a.m. The Ldn descriptor uses the same methodology except that no artificial increment is added to the hours between 7:00 and 10:00 p.m. Both descriptors give roughly the same 24-hour level with the CNEL being only slightly more restrictive. The county's General Plan allows the use of either descriptor.

The San Bernardino County General Plan presents interior and exterior noise level standards for both mobile and locally regulated sources. The overall purpose of the Plan is to protect the citizens of the County from the harmful and annoying effects of exposure to excessive noise and protect the economic base of the County by preventing the encroachment of incompatible land uses within areas affected by existing noise-producing uses. Under the County General Plan, noise sources that are stationary are regulated under Hourly Noise Level Performance Standards that limit the level of noise that can be transmitted from one site to another. The noise level limits for residential and other noise-sensitive areas are not to exceed 55 dBA Leq for 30 minutes. The level may be increased to 60 dBA Leq for 15 minutes, 65 dBA Leq for 5 minutes, and 70 dBA Leq for 1 minute. These levels are applicable to the hours between 7:00 a.m. and 10:00 p.m. For the hours between 10:00 p.m. and 7:00 a.m., the 30-minute Leq becomes 45 dBA with 50, 55, and 60 dBA Leqs allowable for 15, 5, and 1 minute, respectively. Noise levels are not to exceed the noise standard plus 20 dBA for any period of time.

With respect to mobile sources, residential areas are limited to an exterior Ldn or CNEL of 60 dBA (65 dBA if substantially mitigated). This level would apply to any project-generated traffic that may pass any sensitive receptors. Open space areas, such as parks and recreational areas, are limited to an Ldn or CNEL level of 65 dBA. Table 3.9-1 presents the standards for mobile noise sources, and Table 3.9-2 presents standards for locally regulated sources. Both are as presented in the San Bernardino County General Plan.

The Department of the Army has also established noise level limitations for activities in proximity to residential areas. Army Regulation 200-1 (AR 200-1) implements all federal laws concerning environmental noise for Department of the Army activities. These laws include the Quiet Communities Act of 1978, the Noise Control Act of 1972, and federal regulations such as EPA Procedures for Reporting Proposed Pollution Abatement Projects for Federal Facilities. The primary strategy of the Department of the Army to protect humans and animals from environmental noise impacts is through land use planning. The

Table 3.9-1

INTERIOR/EXTERIOR NOISE LEVEL STANDARDS - MOBILE NOISE SOURCES

Land Use		Ldn (or CNEL), dB	
Category	Uses	Interior*	Exterior**
Residential	Single-family and multifamily, duplex, mobile homes	45	60***
Commercial	Hotel, motel, transient lodging	45	60***
	Commercial retail, bank, restaurant	50	n/a
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, movie theater	45	n/a
Institutional/Public	Hospital, nursing home, school classroom, church, library	45	65
Open Space	Park	n/a	65

*** Indoor environment excluding bathrooms, kitchens, toilets, closets, and corridors.**

**** Outdoor environment limited to private yard of single-family dwellings, hospital/office building patios, multifamily private patios or balconies, park picnic areas, hotel and motel recreation areas, school playgrounds, and mobile home parks.**

***** An exterior noise level of up to 65 dB (CNEL) will be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best noise reduction technology and interior noise exposure does not exceed 45 dB Ldn (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level will necessitate the use of air conditioning or mechanical ventilation.**

Table 3.9-2

HOURLY NOISE LEVEL PERFORMANCE STANDARDS - LOCALLY REGULATED SOURCES*

Land Use Category	7 a.m. - 10 p.m.		10 p.m. - 7 a.m.	
	Leq	Lmax	Leq	Lmax
Residential or other noise-sensitive receivers (dBA)	55	75	45	65

*** Noise sources that are stationary and not preempted from local noise control. Preempted sources include vehicles operated on public roadways, railroad line operations, and aircraft in flight.**

Installation Compatible Use Zone (ICUZ) Program implements Army policy on land use planning. Housing, schools, and medical facilities are considered noise-sensitive land uses under this regulation. The Department of the Army maintains a noise standard of 65 dBA Ldn as the acceptable exterior noise level for residential land uses in ICUZ areas. Although this would appear to conflict with the County ordinance, federal projects need not comply with state and local noise criteria.

Three noise zones are defined in AR 200-1: Zone I (Acceptable), Zone II (Normally Unacceptable), and Zone III (Unacceptable). Table 3.9-3 presents an assessment conducted by the Army of land use planning in Army environs. The "Army Environmental and Occupational Hygiene Laboratory Report" was published in January 1986 by the USAEHA. The purpose of this report was to evaluate the environmental noise produced from training activity at the Fort Irwin NTC. According to this report, environmental noise created by activity at NTC is minimal because of the NTC's size and remoteness.

Table 3.9-3

LAND USE
COMPATIBILITY GUIDELINES FOR NOISE

Zone	Population Annoyance (percent)	LdnA* (dBA)	LdnC** (dBC)
I	< 15	< 65	< 62
II	15 to 39	65 to 75	62 to 70
III	> 39	> 75	> 70

* **A-weighted day-night level (LdnA) closely resembles the frequency response of human hearing (helicopters, vehicles).**
** **C-weighted day-night level (LdnC) measures the low-frequency component of noise (i.e., noise responsible for causing windows and buildings to shake--some forms of artillery firing and supersonic overflights).**

3.9.1 Ambient Noise

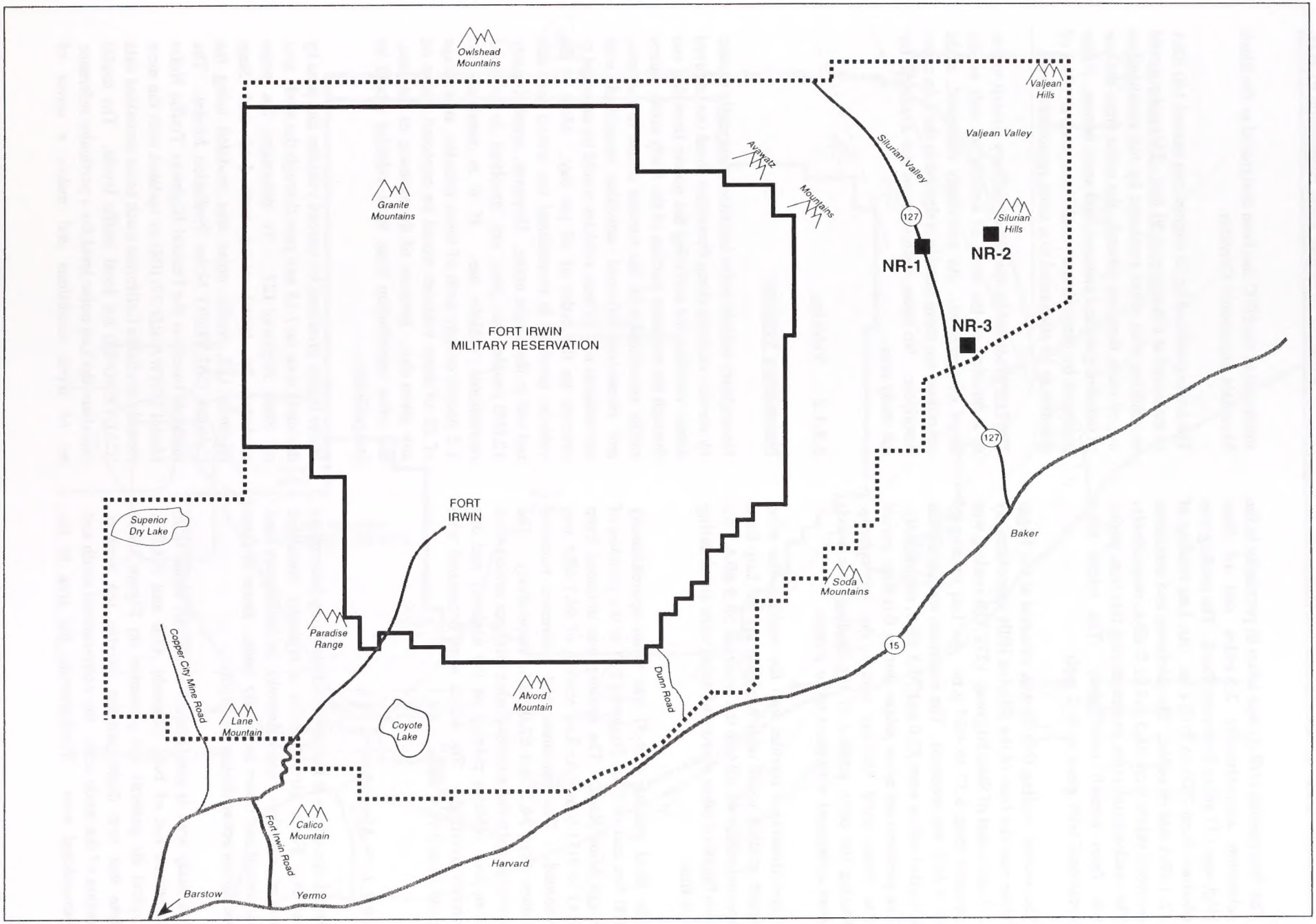
The ambient noise environment within the study area is determined primarily by military operations. Military training exercises conducted at the NTC include ground maneuvers by Army vehicles (including heavy vehicles and tanks), artillery firing, air operations, air-to-ground gunnery and firing, and transportation to, from, and within the NTC during and after maneuvers. Other military aircraft that operate routinely within the Memorandum of Agreement (MOA) areas and established airspace corridors within the study area also contribute to the existing noise environment. The airspace corridors are discussed in Section 3.18 (Airspace). The majority of these aircraft are stationed at Edwards AFB near Lancaster. Air operations at NAWS Mojave B Range also contribute to the ambient noise produced in the western portion of the study area. Noise contours developed for Edwards AFB show that the southwest portion of existing NTC property and the western end of the study area lie within the 57-dBC Ldn contour (BLM 1987a). This is within the acceptable noise limit of 62 dBC Ldn for noise-sensitive uses in ICUZ areas. Occasional sonic booms are generated from the supersonic corridor located in the southern section of the base. Secondary contributors to the noise environment include traffic along I-15 and State Highway 127 and commercial and private aircraft that fly outside of the NTC's existing boundaries.

To ascertain the existing noise levels for the Silurian Valley portion of the study area, Chambers Group conducted field monitoring in the study area on September 23, 1992. The survey revealed that noise within the Silurian Valley area is characterized by the natural sound of the wind, as well as the sound produced by aircraft overflights. Near State Highway 127, traffic noise predominated.

Noise monitoring was conducted using a Larson-Davis LDL Model 700 Dosimeter/Type 2 Integrating Sound Level Meter. The unit meets the American National Standards Institute (ANSI) Standard S1-4-1983, Type 2 and International Electrotechnical Commission Standard 651, Type 2.

The unit was calibrated prior to the first set of readings. The accuracy of the calibrator is maintained through a program established through the manufacturer and is traceable to the National Bureau of Standards. The unit meets the requirements of ANSI Standard S 1.2-1971 and International Electrotechnical Commission Publication 123-1961.

Ten-minute Leq noise readings were obtained at three locations, all situated within the eastern portion of the study area. Noise level locations are shown on Figure 3.9-1.



NOISE MEASUREMENT LOCATION
Figure 3.9-1

The first reading (NR-1) was taken in proximity to the substation approximately 2.5 miles east of State Highway 127 along Powerline Road. The reading was obtained from 7:00 to 7:10 a.m. An Leq reading of 42.3 dBA was recorded. The minimum and maximum recorded values were 33.5 and 62.0 dBA, respectively. The predominant noise source during this time period was from aircraft overflights. The winds were occasional with gusts up to 2 mph.

The second reading (NR-2) was obtained at the Riggs Mine near the base of the Silurian Hills approximately 5.3 miles east of State Highway 127. The reading was obtained from 3:57 to 4:07 p.m. An Leq reading of 58.9 dBA was recorded. The minimum and maximum recorded values were 32.0 and 70.5 dBA, respectively. The predominant noise source during this time period was from wind blowing across the microphone. During the early portion of the reading, the winds were occasional with gusts up to 2 mph.

Approximately 8 minutes into the reading, the wind began gusting to 10 mph bringing up the Leq from approximately 40 dBA to the recorded 58.9 dBA. No overflights or other sources of noise were noted during this time.

The third reading (NR-3) was taken approximately 100 feet east of State Highway 127 at the junction of Riggs Mine Road. The reading was obtained from 4:41 to 4:51 p.m. An Leq reading of 49.1 dBA was recorded. The minimum and maximum recorded values were 34.5 and 62.0 dBA, respectively. The predominant noise sources during this time period were from four vehicles passing on the highway and one aircraft overflight. The winds were occasional with gusts from 3 to 4 mph.

3.9.1.1 Aircraft

Aerial operations at the NTC include Army helicopters and Air Force aircraft. In a typically simulated combat situation, approximately 34 helicopters and 25 aircraft are flown on a daily basis. Some of these operations occur during the night.

The study area is also subject to aircraft noise from operations out of both Edwards AFB and NAWS. Typical air patterns are presented on Figure 3.9-2. Note that two flight patterns overlap the western portion of the study area: the conventional south and conventional west. Furthermore, the area to the southwest of the NTC has been designated as the Black Mountain Supersonic Corridor.

The noise produced by jet engines can exceed 140 dBA as measured at a distance of 50 feet. This noise would be additive with noise produced by the simultaneous use of more than one aircraft, the noise from the use of onboard guns and cannons, and sonic booms. Noise produced by these aircraft could take several miles of distance to be attenuated to a more reasonable level.

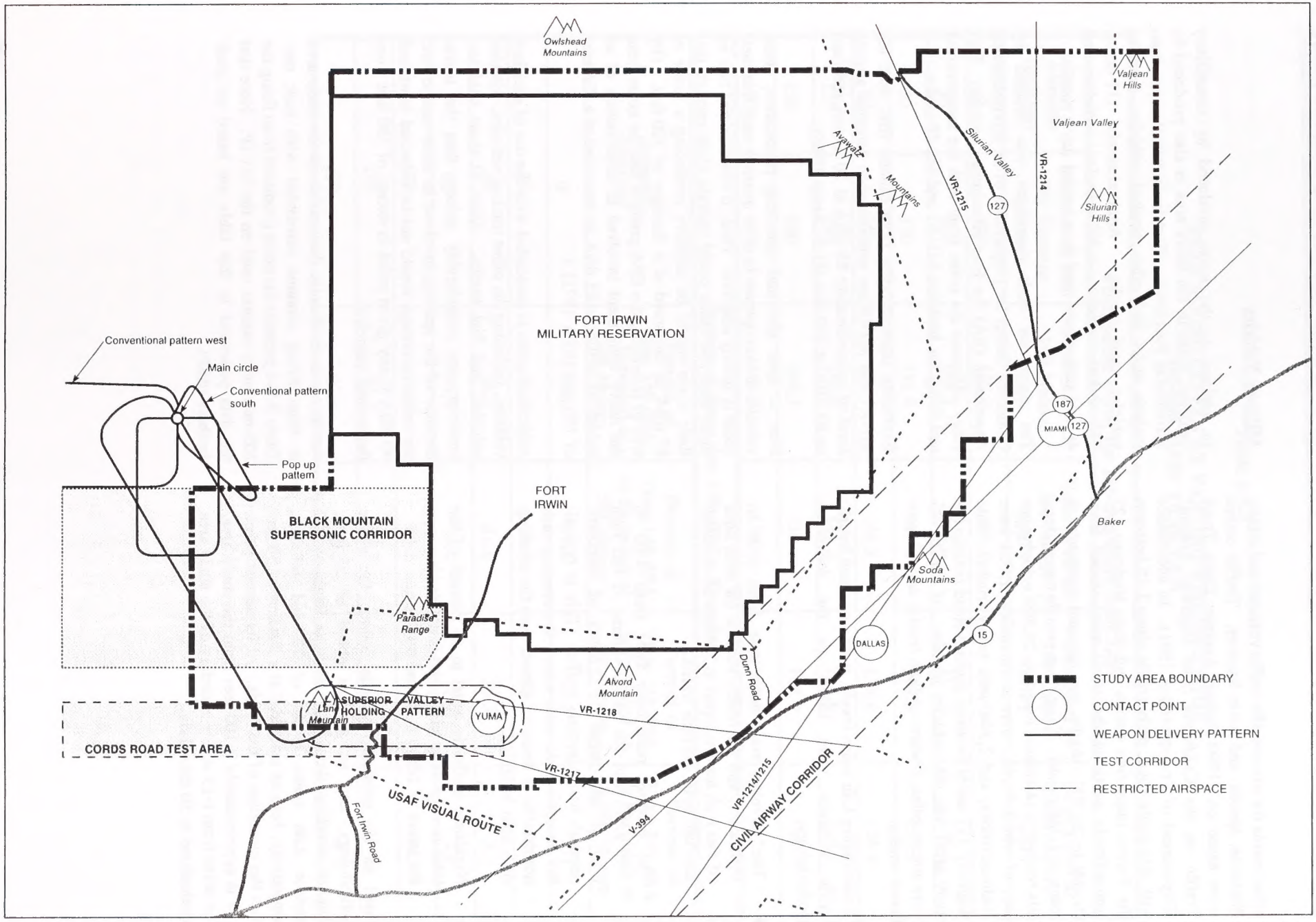
The Ldn produced by the use of military aircraft varies as a function of the level of activity as well as the hours of operation. As previously discussed, night operations are more heavily weighted in the Ldn noise descriptor. No noise contour maps are available for the study area.

3.9.1.2 Vehicles

Nonmilitary Vehicles

Nonmilitary vehicle noise intrusion is currently caused by service vehicles along Powerline Road (an unpaved access corridor for servicing the power lines that run through the southern portion of the study area), minor traffic associated with the various mines in the area, and occasional off-road activities associated with recreational use. These vehicles would be expected to average on the order of 40 per day. Most of the vehicles involved in recreational use would park and not add to the onsite noise. However, approximately 12,000 people per year are involved in off-road recreational vehicle use. If it is assumed that 1.5 people occupy each of these vehicles, an average of 22 of these vehicles would be expected onsite on any given day. Because of the vastness of the area, the noise contribution from these vehicles would be insignificant.

Noise is also produced by onroad vehicles that pass by the study area on I-15 and pass through the study area on State Highway 127. To determine the noise produced by travel along both I-15 and State Highway 127, traffic noise was modeled using the Caltrans CALVENO Noise Prediction Model. The model is based on the Federal Highway Traffic Noise Model (FHWA-RD-77-108) as updated with the most recently available California truck noise emissions data (CALVENO-85) for local traffic levels. The model calculates the Leq noise level for a particular reference set of input conditions and makes a series of



AIR CORRIDORS AND THE SUPERIOR VALLEY AIR TO GROUND GUNNERY RANGE

Figure 3.9-2

adjustments for site-specific traffic volumes and mixes, distances, speeds, and noise barriers. Traffic counts were based on "1990 Annual Average Daily Truck Traffic on the California State Highway System" (Department of Transportation 1991). In accordance with this publication, daily traffic along I-15 between the Yermo inspection station and State Highway 127 (immediately south of the study area) varied from 20,900 to 24,800 vehicles per day and contained as many as 3,348 trucks. Noise from vehicle travel along this route was calculated based on 24,800 vehicles per day, of which 21,452 were automobiles, 1,004 were medium trucks, and 2,344 were heavy trucks. State Highway 127 use at Saratoga Springs Road (within the study area) was 400 vehicles per day, of which 345 were automobiles, 8 were medium trucks, and 47 were heavy trucks.

In calculating Ldn noise levels, traffic mix and hourly traffic volumes were based on the following methodology:

- The morning rush hour lasts from 6:00 to 9:00 a.m., and the traffic volume for each hour of this rush hour is equal to 2 hours of standard, nonrush hour daytime traffic.

- The evening rush hour lasts from 4:00 to 7:00 p.m., and the traffic volume of this rush hour is also equal to 2 hours of standard, nonrush hour daytime traffic. This is typical, but exceptions do exist where the evening rush hour traffic is lesser or greater than the morning rush hour volume.

- Nighttime traffic is equal to 15 percent of the total average daily traffic and is divided between the hours of 10:00 p.m. and 6:00 a.m.

Based on the published vehicle counts, the above methodology, and an average speed of 55 mph, vehicles traveling along I-15 and State Highway 127 produce Ldn noise levels of 77 and 60 dBA, respectively, both as measured at a distance of 50 feet from the centerline of the roads. At its nearest point, I-15 is approximately 3,100 feet from the study area. The noise from I-15 at this boundary of the study area is calculated at 50 dBA Ldn.

Military Vehicles

In addition to the noise produced by nonmilitary vehicles, noise in the study area is also produced by activities at Fort Irwin. Fort Irwin vehicle operations include tanks and other tracked vehicles, wheeled vehicles, and trucks. Approximately 117 tanks, 522 tracked vehicles, 1,397 wheeled vehicles, and 46 fuel tankers are used on a typical day's rotation.

The noise for tank operations was studied by Chambers Group for preparation of an Environmental Assessment (EA) for Fort Huachuca, Arizona. This study addresses the noise from both the maneuvering and firing for both the M1-A1 and M1-IP tanks.

Excluding impulse noise from cannon fire, both the M1-A1 and M1-IP are anticipated to generate a noise level of approximately 88 dBA at 20 meters (66 feet) or 84 dBA at 100 feet (U.S. Army 1986).

Due to their size and operating procedures, these vehicles do not operate in close quarters such that their noise is strictly additive. Thus, it was assumed that no more than two tanks could operate close enough that their noise would be additive producing a noise of 87 dBA as measured at a distance of 100 feet. (By way of reference, the EPA predicts that the noise from the heavy equipment involved in construction of an industrial facility is 83 dBA as measured at a distance of 100 feet [EPA 1971].)

Additional noise is associated with the use of ancillary vehicles, including the other tracked vehicles, wheeled vehicles, and fuel trucks. Most of these vehicles, however, are considerably quieter than the tanks. Because of the spacing involved in these maneuvers, the entire entourage would not be expected to exceed 90 dBA at any given point in excess of 100 feet from the nearest vehicles.

Another source of noise discernable in the study area is from firing cannons associated with tank use. Table 3.9-4 presents the noise produced from firing the 105-mm main cannon used on the M1-IP. Note that the data presented in this table are based on peak decibels (dBP).

Table 3.9-4

PEAK SOUND LEVELS AT VARYING DISTANCES FOR 105-mm MAIN TANK GUN

Peak Sound Levels for 105-mm Main Tank Gun					
Azimuth (degrees)	**Distance to 140 dBP Contour (meters)**	**Noise Level at 100 Meters (dBP)**	**Noise Level at 200 Meters (dBP)**	**Noise Level at 500 Meters (dBP)**	**Noise Level at 1,000 Meters (dBP)**
0	420	158.9	149.3	136.7	127.2
30	400	158.1	148.6	135.9	126.4
60	370	156.8	147.3	134.6	125.1
90	350	156.1	146.5	133.9	124.4
120	230	150.8	141.2	128.6	119.1
150	180	148.1	138.5	125.9	116.4
180	150	143.7	136.1	121.5	112.0

Percent of Time that 140 dBP is Exceeded				
Azimuth (degrees)	**Percent of Time 140 dBA is Exceeded at 100 Meters**	**Percent of Time 140 dBA is Exceeded at 200 Meters**	**Percent of Time 140 dBA is Exceeded at 500 Meters**	**Percent of Time 140 dBA is Exceeded at 1,000 Meters**
0	99.0	87.6	34.2	5.6
30	98.8	85.6	30.8	4.6
60	98.1	81.6	25.3	3.2
90	97.7	79.0	22.5	2.6
120	90.9	56.1	7.9	0.5
150	84.1	42.7	4.0	0.2
180	67.6	23.4	1.1	0.0

Table 3.9-4

PEAK SOUND LEVELS AT VARYING DISTANCES FOR 105-mm MAIN TANK GUN

Percent of Time that 130 dBP is Exceeded				
Azimuth (degrees)	**Percent of Time 130 dBA is Exceeded at 100 Meters**	**Percent of Time 130 dBA is Exceeded at 200 Meters**	**Percent of Time 130 dBA is Exceeded at 500 Meters**	**Percent of Time 130 dBA is Exceeded at 1,000 Meters**
0	100.0	99.2	79.7	36.3
30	100.0	98.9	77.0	32.8
60	100.0	98.4	71.7	27.2
90	99.9	98.0	68.5	24.2
120	99.5	91.8	43.2	8.8
150	98.7	85.4	30.6	4.6
180	95.5	69.7	14.7	1.3
Percent of Time that 115 dBP is Exceeded				
Azimuth (degrees)	**Percent of Time 115 dBA is Exceeded at 100 Meters**	**Percent of Time 115 dBA is Exceeded at 200 Meters**	**Percent of Time 115 dBA is Exceeded at 500 Meters**	**Percent of Time 115 dBA is Exceeded at 1,000 Meters**
0	100.0	100.0	99.6	93.4
30	100.0	100.0	99.5	92.1
60	100.0	100.0	99.3	89.4
90	100.0	100.0	99.0	87.7
120	100.0	99.9	95.4	69.3
150	100.0	99.8	91.2	56.7
180	100.0	99.1	79.1	35.5
Table provided by William Russell, Bio-Acoustics Division USAEHA				

In accordance with the data presented in Table 3.9-4, the equation for the attenuation of the impulse noise produced by the 105-mm cannon is

$$Attenuated\ dBP = 31.74\ (\log)\ \frac{measured}{reference}$$

At its nearest point, the study area is located approximately 1.5 miles east of the boundary of the actual live-fire maneuvers area (Figure 2.3-4). A worst-case scenario would be to have the cannon pointed at a 0-degree azimuth. The peak noise produced at this location in the study area is then calculated at 99.5 dBP. The presented data are for firing one cannon. Each time, that number increases by 3 dB. Thus, the simultaneous use of two cannons would raise the 99.5 dBP level to 102.5 dBP, while four cannons would raise the level to 105.5 dBP, and so forth. (In actuality, the offsite noise levels would be lower than presented here because the cannons would be directed westward away from the Silurian Valley area or the ordnance would travel offsite.)

According to Mr. William Russell, Environmental Protection Specialist with the USAEHA (December 8, 1992), the 105-mm main gun used in the M1-IP produces a peak level that is approximately 5 dBP less than the 120-mm main gun used in the M1-A1. Thus, when the 120-mm cannons are used, the noise at the distances presented in Table 3.9-4 would increase by 5 dBP. Similarly, each time that the number of cannons fired simultaneously doubles, the noise level will rise by 3 dBP.

The 50-caliber and 7.62-mm machine guns on the tanks produce a sound pressure level of 140 dBP at distances of 105 and 50 feet, respectively (Memorandum for Commander 63D U.S. Army Reserve Command, U.S. Army 1992).

In addition to the noise produced by firing the main gun, noise is also produced by the projectile as it progresses through the air. Conversation with Mr. Russell revealed that the projectile travels at a speed approximately 4.5 times the speed of sound; consequently, the projectiles produce a "sonic boom" similar to that produced by aircraft that fly at supersonic speeds. Mr. Russell said that, although this is a very real effect, it has not been quantified.

3.9.2 Sensitive Receptors

The study area is mainly characterized by open desert and rocky hills. The nearest offsite population centers are located in Baker, approximately 9 miles east from the extreme eastern edge of the study area and in Barstow, approximately 10.5 miles south from the southwest edge of the study area. Few structures are located in the study area, and any sensitive receptors located onsite would be relocated prior to site acquisition.

For onsite receptors, the NTC contains 1,103 family housing units, a hospital, and a school. These facilities are located approximately 7.5 miles from the study area at the nearest point.

Sensitive receptors need not be limited to humans. Several sensitive animal species are located in the study area (see Section 3.5.3 for a listing of these sensitive species). Nonhuman receptors located onsite anticipated to have the greatest chances of being disturbed by noise include bats, raptors, and the bighorn sheep that frequent the area. However, little is known regarding the response of the ground squirrels and tortoises to excessive noise intrusion.

Documentation has shown that raptors frequenting the study area are most susceptible to noise intrusion during the breeding season. The local bat population is migratory, but when in the study area would be most sensitive to noise intrusion at night when foraging. Bighorn sheep are also migratory between the Avawatz Mountains and mountain ranges to the north and south. The desert tortoise is mainly located in the Valjean Valley. The Mohave ground squirrel shows a patchy distribution in the southern, eastern, and western portions of the study area.

3.10 LAND USE

3.10.1 Applicable Land Use Policies

3.10.1.1 Land Ownership

The entire study area (the area encompassing all acquisition alternatives) includes approximately 625,920 acres of land. This land area is comprised of public lands managed by the BLM, state lands, and private holdings. The ownership of lands within the study area is shown on Figure 3.10-1. Table 3.10-1 lists the acreages of each type of ownership within the study area. Approximately 509,151 acres (81.3 percent) of the study area are owned by the BLM while another 95,217 acres (15.2 percent) are privately owned. State lands comprise approximately 21,552 acres (3.4 percent) of the study area.

Table 3.10-1

LAND OWNERSHIP WITHIN STUDY AREA (acres)

Federal/ Public Land	State Land	Private Land	Total
509,151	21,552	95,217	625,920

3.10.1.2 Federal Lands Administered by the Bureau of Land Management

Land Use Policies

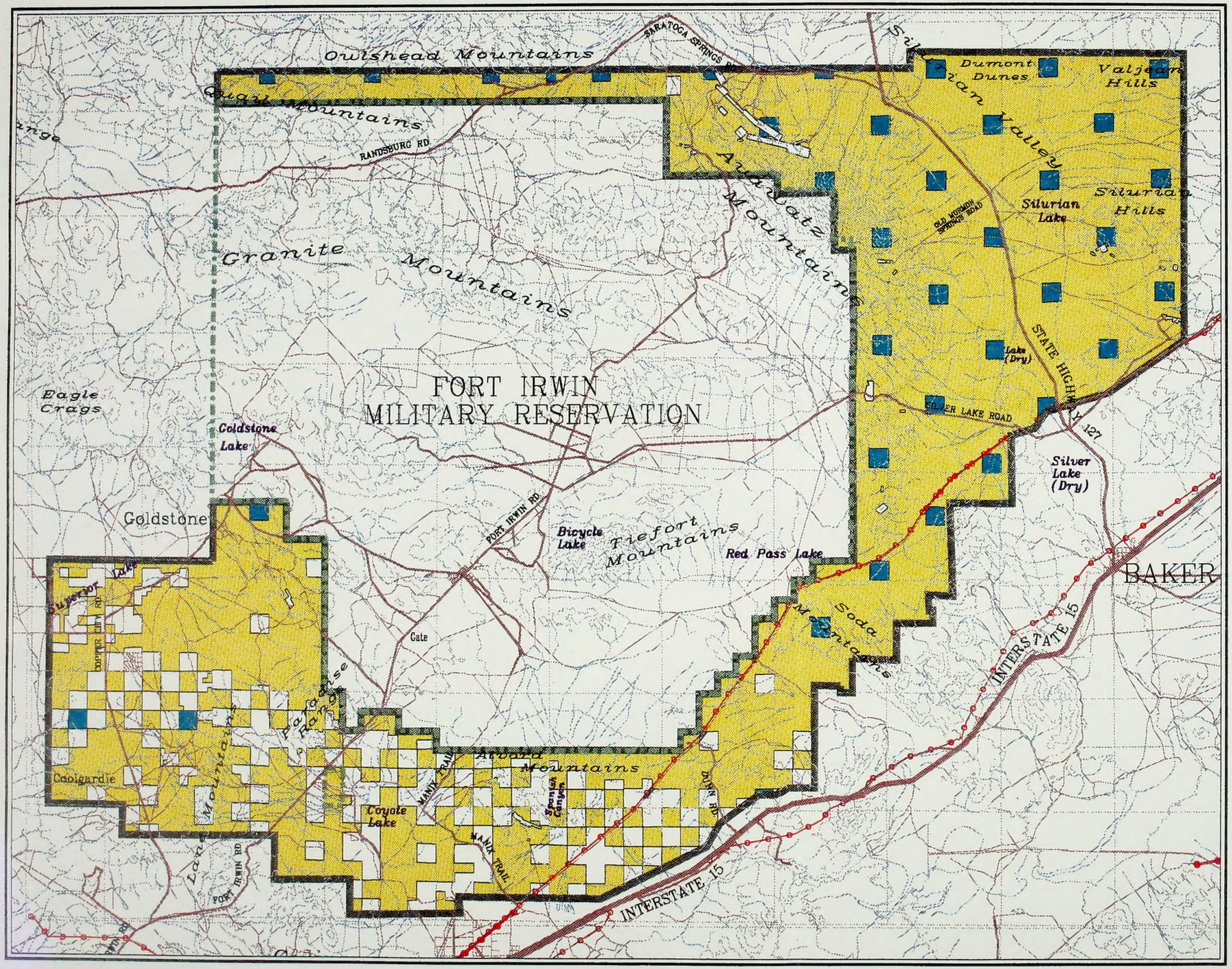
The land use policy of BLM-administered lands in California is complex. Because a large part of the study area is predominantly BLM-administered lands, an understanding of BLM land use policy is required for thorough analysis of potential project impacts. The principles and practices of management are detailed in the following sections.

The Federal Land Policy and Management Act (FLPMA) was enacted by Congress in 1976 to direct the management of public lands in the United States. Two requirements of the Act have had an influence on the management of BLM-administered lands in California. First, the Act required that the BLM inventory, study, and review all 17 million acres of public lands in California for their wilderness characteristics as described in the Wilderness Act of 1964. The term wilderness study area (WSA) refers to the 209 areas throughout California that met preliminary wilderness characteristics criteria and became the object of detailed study. The wilderness characteristics of the WSAs located within the study area are further discussed in Section 3.17.

Second, approximately 25 million acres of California desert covering portions of Inyo, Kern, Los Angeles, Riverside, and San Diego Counties and all of San Bernardino and Imperial Counties were designated as the California Desert Conservation Area (CDCA). Section 601 of the FLPMA mandated that the BLM inventory the approximately 12.1 million acres of public lands within the CDCA and prepare a comprehensive land-use management plan. The plan was to address management within a framework of ". . . multiple use and sustained yield, and the maintenance of environmental quality." Section 103 of the FLPMA defines the term "multiple use" in part as follows:

> . . . the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American People; . . . provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions;. . .a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources . . .; harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment . . .

In accordance with this requirement, the BLM prepared the CDCA Plan (1980, as amended) to take into account multiple use management and sustained yield in providing for resource use and development, including maintenance of environmental quality, rights-of-way, and mineral development.



Explanation

- Private
- Bureau of Land Management (BLM)
- State of California
- Power/Transmission Lines

Entire Study Area
LAND OWNERSHIP
Figure 3.10-1

Chambers Group, Inc.

5 2.5 1.25 0 5 Miles

1" = 30000'
Project# 6347
December 04, 1996

December 04, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

California Desert Conservation Area Plan

The CDCA was established by Congress in 1976 with the passage of the FLPMA. The CDCA is comprised of approximately 25 million acres and encompasses the southeastern desert area of California. The BLM California Desert District manages the public lands, approximately 12.1 million acres, within the CDCA using the 1980 CDCA Plan (also known as the Desert Plan). This Plan provides a comprehensive management plan for the management, use, development, and protection of the CDCA for at least a 20-year time period. The goal of the plan is to provide for the use of public lands and resources of the CDCA "including economic, educational, scientific and recreational uses, in a manner which enhances wherever possible - and which does not diminish, on balance - the environmental, cultural, and aesthetic values of the Desert and its future productivity." The plan uses two types of land use classifications: Multiple-Use Classifications and Area of Critical Environmental Concern (ACEC) designations. These classifications and their respective management objectives and locations within the study area are detailed below.

Multiple Use Classifications

Section 601 of FLPMA mandated that the CDCA Plan include management principles of multiple-use and development for everything from wilderness and wildlife to grazing and mineral development. Subsequently, multiple use classifications were developed in the CDCA Plan with Amendments to guide levels of resource use and protection in the California desert. CDCA lands administered by the BLM have been designated geographically into four multiple-use classes: controlled, limited, moderate, and intensive. These classes were based on the sensitivity of resources and kinds of uses for each geographic area. Each class describes a different type and level (or degree) of use that is permitted within that particular geographic area. The Plan allows for a wide range of activities including, but not limited to, wilderness area backpacking, cattle grazing, mining, and OHV use.

The four multiple-use classifications are defined as follows:

1. Multiple-Use Class C (controlled use) lands are managed as wilderness areas with all motorized equipment prohibited. Access is allowed by foot or horse/mule only, and resource extraction or any physical change to the land form is prohibited. Sale or exchange of Class C lands is prohibited.

2. Multiple-Use Class L (limited use) protects sensitive resource values by allowing only low-intensity use of resources. Special care is emphasized to ensure that sensitive resources are not significantly diminished. Sale of Class L lands is prohibited.

3. Multiple-Use Class M (moderate use) provides for a controlled balance between higher intensity use and protection of public lands. This class allows for a wide variety of land uses, and management practices include mitigation of damage caused by the permitted uses. Class M lands may be sold or exchanged.

4. Multiple-Use Class I (intensive use) provides for a concentrated use of land and resources. Mitigation of impacts on resources and rehabilitation of impacted areas will occur if possible. Class I lands may be sold or exchanged.

BLM lands within the CDCA have been classified approximately as follows: 15.9 percent Class C lands; 51.4 percent Class L lands; 26.4 percent Class M lands; 4.4 percent Class I lands; and 0.9 percent undesignated (BLM 1991).

Areas of Critical Environmental Concern

The California desert contains an unusual diversity of plant and animal life, unique geologic features and fossil deposits, rare concentrations of the remains of historic and prehistoric use, and other significant resources of value. The CDCA Plan addresses the management of areas exhibiting concentrated or very sensitive resources through the ACEC Program. The FLPMA defines an ACEC as an area

> . . . within the public lands where special management attention is required . . . to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes . . .

The goals of the ACEC Program are to (1) identify and protect the significant natural and cultural

resources found on BLM-administered lands in the CDCA, (2) provide for other uses in the designated areas that are compatible with the protection and enhancement of the significant natural and cultural resources, and (3) systematically monitor the preservation of the significant cultural and natural resources on BLM-administered lands and the compatibility of other allowed uses with these resources. Site-specific management plans have been developed for each designated ACEC. Seventy-eight ACECs are in the CDCA.

California Desert Protection Act of 1994

The California Desert Protection Act (CDPA) was enacted by Congress on October 4, 1994 and signed into law on October 31, 1994. This act states that "In order to secure for the American people of this and future generations an enduring heritage of wilderness, national parks, and public land values in the California desert, it is hereby declared to be the policy of the Congress that--(1) appropriate public lands in the California desert shall be included within the National Park System and the National Wilderness Preservation System." This act designates wilderness areas to be administered by the BLM. Based on recommendations by the BLM of its inventory, study, and review of WSAs, the CDPA designates 69 wilderness areas comprised of approximately 3.5 million acres in the California Desert and establishes Death Valley, Joshua Tree, and Mojave National Parks. The CDPA also retains seven areas as WSAs. These areas are further discussed in Section 3.17.

Western Mojave Land Tenure Adjustment

Since 1982, amendments to the CDCA Plan have been made annually to clarify site-specific planning decisions. One relatively recent amendment to the CDCA Plan (amended 1991) is the Western Mojave Land Tenure Adjustment (WMLTA) Project. A Final EIS was completed for the WMLTA Project, and the Record of Decision was completed in 1991. The WMLTA project seeks to acquire private lands in areas where resource protection should occur and to transfer the property rights to other federally owned lands in areas more suitable to future development. The project uses a voluntary exchange program to acquire private land holdings north and west of Barstow and transfer them to public lands located south and west of Barstow. No condemnation proceedings are part of this project. If private land holders do not wish to exchange land, no action will be taken. The BLM will not prevent private landowners from selling or using their property, but the property will be subject to local ordinances or state law. The land exchange is based on the values of the land and not acreage.

The WMLTA study area contains 2.8 million acres and abuts the western edge of the existing NTC, south of Goldstone and west of Fort Irwin Road. It is estimated that the WMLTA Project would transfer approximately 40,000 acres of state and private lands within the study area, west of Fort Irwin Road, to federal ownership. State lands are administered by the California State Lands Commission (SLC). Remaining lands are privately held and could be voluntarily exchanged. Private land holdings would become public lands managed by the BLM for resource protection and multiple use.

Three different zones make up the WMLTA study area: a consolidation zone where ownership is consolidated into public ownership, a retention zone where ownership is not proposed for transfer, and disposal zones where ownership would be transferred from public to private.

The WMLTA project objectives are to

1. acquire private inholdings that are remote and wild and retain the potential to be managed for resource protection and other multiple uses under the Multiple-Use Class L,

2. reduce the risk of high-density residential development underneath airspace used by Edwards AFB, and

3. encourage private development to occur in logical areas for community development, near other populated areas, rather than in remote locations. This reduces the level of effort required to provide services from the County of San Bernardino.

West Mojave Coordinated Management Plan

The West Mojave Coordinated Management Plan is in the development process and when completed will provide for the protection of the desert tortoise and the Mohave ground squirrel in the western Mojave region of southern California. The BLM, in cooperation with

the USFWS and the CDFG, is leading this multiagency-coordinated management planning effort.

This multiagency planning effort will seek to (1) balance protection of the desert tortoise with planned community expansion and wise resource utilization, (2) establish equitable and consistent conservation measures to protect the desert tortoise, (3) establish a coordinated multiagency approach to tortoise management, and (4) find the best solution for managing viable, wild desert tortoise populations within the western Mojave Desert. Mohave ground squirrel habitat will be included in the planning effort.

The planning area will involve approximately 8.6 million acres of habitat within the western portion of the Mojave Desert. Both public and private lands fall within this area that extends from Olancha on the north to the San Bernardino Mountains on the south and from Antelope Valley on the west to Twentynine Palms on the east. The southeast portion of the study area is located in the planning area and will be reflected in the West Mojave Coordinated Management Plan. However, because details of the West Mojave Coordinated Management Plan are not yet available, analysis of any impacts from the proposed expansion on this plan will not be possible in this document.

Unusual Plant Assemblages

UPAs are those stands of vegetation within the CDCA that can be recognized as extraordinary because of one or more factors, including unusual age, unusual size, unusually high cover or density, or disjunction from main centers of distribution. Plant associations that are relatively rare in the desert because of their alliance with restricted and discontinuous habitats are also considered UPAs. A number of UPAs have been identified within the CDCA and are grouped according to their sensitivity to disturbance.

The BLM, through its planning system, will identify and designate special areas possessing representative rare, unique, and unusual features of ecologic, geologic, and aquatic value for protection and preservation. Representative unique, unusual, or otherwise significant ecosystems, including those containing UPAs, will be identified and included in the special area management program. This program includes, but is not limited to, the BLM Natural Area Program, ACEC, and the National Landmarks Program. These areas will be large enough to ensure the continued existence of natural ecosystems. There are various management options for UPAs and a classification system based on sensitivity. Highly sensitive and very sensitive UPAs will be treated in a manner that preserves the habitat and ensures the continued existence of the plant assemblages (BLM 1980). The crucifixion thorn assemblage UPA near the Cronese Mountains is located in the study area northeast of Dunn Road. The crucifixion thorn woodland occupies approximately 1,005 acres and is characterized by the dominance (at least visually) of a small tree called crucifixion thorn.

Grazing Allotment Management Plan

Livestock grazing is another element of the CDCA Plan and is also managed by the Interim Management Policy for lands under wilderness review. Livestock grazing has been and continues to be a significant use of renewable resources on public land in the California desert.

Current BLM grazing management practices are concerned with the administration of stocking levels, turnout times, levels of forage use, season of use, monitoring and adjustment procedures, watering and handling practices, and range improvement. Within fragile habitats, the BLM management practices are to fence, with adequate provision of water, and monitor use by livestock in such a way as to ensure that proper use levels of forage are not exceeded and that natural and cultural resource values are protected. Range improvements and specific management prescriptions for grazing lands are developed and implemented with allotment management plans.

Grazing units have been divided into three types: perennial, ephemeral, and ephemeral/perennial. These classifications are based on the variability in the amount, quality, and timing of forage productions. Perennial range types consist mostly of woody shrubs and bunch grasses and are generally characterized by consistent forage production due to predictable winter precipitation. Ephemeral range types consist primarily of annual forbs and grasses, with production varying considerably from year to year. Ephemeral/perennial range type is an intermediate type or combination of the previous two types.

3.10.1.3 Lands Administered by the State

State of California lands within and in the vicinity of the study area include (but are not limited to) state lands designated by the federal government for schools. Some of the state lands within the study area are part of the approximately 579,000 acres that remain of the original school lands grant made to California by Congress after its entry into the Union. California's school lands contain some of the state's unique desert lands and minerals, as well as timber and grazing lands and the nation's largest producing geothermal energy field. In addition to its fee ownership of these lands, the state also maintains a right to the mineral interests in another 760,000 acres of sold school lands and has an outstanding claim to additional acres (52,000 to 58,000 acres) that are still owed to the state by the federal government. The SLC holds jurisdiction over these resource-rich properties. Because of the environmental significance of these lands, the SLC has the opportunity to plan exchanges with federal agencies that will protect desert areas, while at the same time enhance the overall values of the school lands assets it holds in trust. Since 1984, the net proceeds generated by the prudent management of these school lands have been allocated to the State Teachers Retirement Fund (Mary Griggs, SLC, personal communication 1993).

3.10.1.4 Private Lands

The study area and surrounding areas are located in unincorporated San Bernardino County. This part of the county is designated as the Desert Region and is divided into five subregional planning areas. The boundaries of these subregional planning areas are conterminous with the boundaries of the five Regional Statistical Areas (RSAs) for the desert. The study area is located within the Baker Subregional Planning area (RSA 31). The Baker Subregion is part of the sparsely settled area of the desert. Large tracts of land are in military installations or used for mining. Land use controls and policies are established by the San Bernardino County General Plan and zoning ordinances. The lack of infrastructure facilities and delivery systems is a major constraint to future development in this subregion (County of San Bernardino 1991). Land uses on nonfederal lands and some governmental land-use functions (such as building and safety and public health) on federal lands leased to private individuals are controlled by the County (MBA 1984).

3.10.2 Existing Land Use

3.10.2.1 Federal/Public Lands

Public lands managed directly by the BLM comprise approximately 509,151 acres (80.8 percent) of the study area. The majority of land under public ownership is located throughout the Silurian Valley and southern portions of the study area. Current land uses in these areas include the following:

- Mining near Dunn Road and in the Avawatz Mountains, Silurian Hills, and Valjean Hills.
- Major utility transmission corridors run through portions of the study area. The Boulder Corridor is aligned northeast and south through the Silurian Valley, and Corridor Q runs due west from the corridor junction near the southeast boundary of the study area. In addition, Corridor BB is outside of and adjacent to the study area to the southeast. Utility corridors are discussed further in Section 3.13.
- A natural gas pipeline parallels the Boulder Corridor, just south of the Silurian Valley portion of the study area.
- Dispersed recreation (rockhounding, sightseeing, and limited OHV use) occurs throughout the Silurian Valley and southern portions of the study area.
- State Highway 127 traverses and bisects the Silurian Valley portion of the study area. I-15 runs southwest to northeast outside of the southern portion of the study area.
- A part of the Amargosa River drainage north of the Avawatz Mountains lies within the northern boundary of the study area.
- Commercial filming permits are issued for several areas within the western Mojave, including Silurian Lake, Superior Lake, Silver Lake, and Dumont Dunes. During the first 10 months of 1993 for the two areas found inside the study area, four permits were issued for Silurian Lake and none were issued for Superior Lake.

Multiple Use Classifications

The approximately 509,151 acres of BLM-administered lands within the study area are comprised of less than 51 percent Class L (limited) lands, 47 percent Class M (moderate) lands, and less than 1 percent Class I (intensive) lands, as depicted on Figure 3.10-2. It should be noted that this figure shows generalized areas of BLM multiple use classes of land. These areas are actually interspersed in a checkerboard pattern with nonclassified state lands.

Within the Silurian Valley portion of the study area, Class L lands are found in three locations. The first area is located in the western extension of the Silurian Valley portion of the study area and it includes the designated Denning Springs ACEC. Management of this ACEC is discussed in the following section. The second area, which encompasses the Avawatz Mountains, is in the southwestern portion of the study area adjacent to the northeastern corner of Fort Irwin boundary. The third area is in the northeastern corner of the study area and represents the Kingston Range WSA and the portion of the Kingston Range Wilderness Area that falls inside the study area. Within the southern portion of the study area, Class L lands are located in the Superior Valley and near the Soda Mountains.

Class M lands comprise a large portion of the Silurian Valley area. Class M lands are located in two parts of the study area. One part covers a small section west of the Avawatz Mountains. The other part covers a large area north and east of the Avawatz Mountains. The Salt Creek ACEC is located within this Class M section, near the northern boundary of the study area. Within the southern portion of the study area, Class M lands are found south of Lane Mountain, near Coyote Lake and Alvord Mountain, and near Silver Lake Road.

Class I lands only occur within the Silurian Valley portion of the study area. These lands encompass the Silurian Lake area.

ACECs Within the Study Area

Two ACECs are located within the Silurian Valley portion of the study area: the Salt Creek Hills ACEC and the Denning Spring ACEC (see Figure 3.10-3). The Denning Spring Cultural Resource ACEC covers approximately 416 acres, overlaps the western portion of the Avawatz Mountains WSA, and is set aside for the protection and management of special cultural resources that occur at four sites. The management objective is to maintain the integrity of the cultural resources for both scientific research and public enjoyment and education and includes a monitoring program. Some patented (but not active) mining claims occur within this ACEC; the BLM is in the process of identifying the landowners.

The Salt Creek Hills ACEC covers approximately 2,009 acres and is located 29 miles north of Baker, off State Highway 127. The ACEC contains a desert stream that provides wetland habitat for a variety of wildlife. The management plan for this ACEC provides specific guidance for protection of riparian vegetation along the desert stream as well as preservation of a variety of historic and prehistoric cultural resource sites. In addition, the ACEC experiences recreational use such as camping because of the proximity of State Highway 127 and the Dumont Dunes Recreational Area to the north, and hunting because of the large numbers of doves. The management plan limits vehicular access to the ACEC to one dirt road and prohibits OHV use. BLM implementation of the Salt Creek Hills ACEC Management Plan is continuing. In 1995 a 1-mile fence was constructed between the little Dumont Dunes and the ACEC to keep off-highway vehicle use out of the sensitive ACEC. A road was constructed into the north end of the area to allow visitors to access the second oldest gold mine in California. An interpretive kiosk containing panels, explaining historical and geographical significances of the area, was erected in late 1996. Additional facilities at the ACEC include a parking area and trail that leads into the riparian area. Construction of an additional kiosk, with panels interpreting the wildlife values of the area, is planned for 1997.

The Cronese Basin ACEC is adjacent to and outside of the study area, and Afton Canyon ACEC is located just outside the southeastern corner of the study area.

Unusual Plant Assemblages

One UPA has been designated in the southern portion of the study area (see Figure 3.10-3). The Cronese Valley crucifixion thorn assemblage (UPA IIE) is located near the southeastern boundary of the study area, west of the Cronese Mountains. It is included in the group of plant assemblages that reach their range limits within the CDCA.

Livestock Grazing

There are no current or proposed grazing allotments located within or adjacent to the Silurian Valley, but several grazing allotments do occur in the southern portion of the study area. Table 3.10-2 presents a summary of the public, private, and state lands included in each of the grazing allotments located within the southern portion of the study area. A total of the public land grazing acreage within each entire allotment is also included.

Table 3.10-2

APPROXIMATE ACRES OF GRAZING LANDS IN SOUTHERN PORTION OF STUDY AREA

Ownership	Allotment (acres)		
	Cronese Lake	Goldstone	Superior Valley
Public	36,924	9,006	105,348
Private	6,720	640	43,200
State	320	640	1,280
TOTAL	**43,964**	**10,286**	**149,828**
Total Public Land Within Allotment	**54,250**	**9,006**	**167,648**

Public lands provide forage for domestic sheep and cattle under Section 15 grazing leases (Taylor Grazing Act of 1934) on the grazing allotments within the southern portion of the study area. Grazing is monitored by the BLM, and the allocations of forage within the grazing allotments are determined by total acreage, forage type and growth characteristics, and current land use. Three grazing areas are partially or totally within the southern portion of the study area (Figure 3.10-4). The allotments are leased to three parties and are effective through 1998. The following descriptive information is derived from BLM file and spatial map data (BLM 1988d).

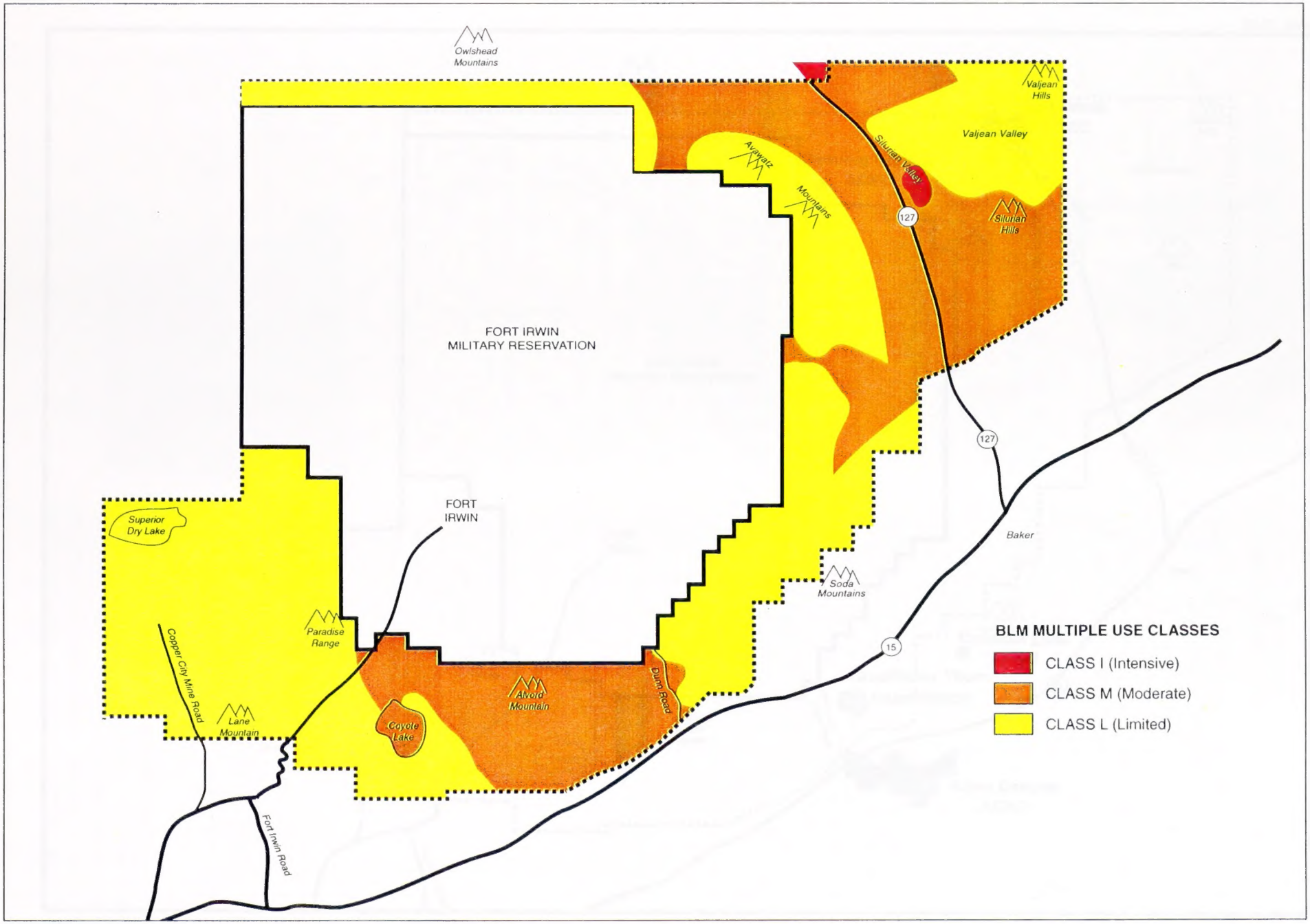
The Superior Valley Allotment was leased to a private company that has the grazing privileges on 167,448 acres of public land and leases 43,200 private and 1,280 state acres. This allotment has been classified as an ephemeral range for sheep use. Ephemeral forage production can be highly variable from year to year, requiring management flexibility in prescribing stocking rates and seasons of use. When the allotment has at least 200 pounds/acre of ephemeral production (air dry weight), an authorization can be given to the lessee. The average number of animal unit months (AUMs [1 AUM is the equivalent forage required to feed five sheep or one cow and calf for 1 month]) on public land for this allotment is 2,247 (1,392 AUMs within the study area). Bidart (1988) has identified this allotment as a critical area for sheep grazing because of its geographical location. The desert feed is usually ready to use when the winter operation is completed in Bakersfield. Therefore, the attributes of the Superior Valley Allotment are optimal for this grazing operation.

The Goldstone Allotment was leased to a private company that has the grazing privileges on 9,006 acres of public land and leases 640 private and 640 state acres. This allotment has been classified as an ephemeral range for sheep use. The average number of AUMs on public land for this allotment is 572 (572 AUMs within study area). The desert feed is usually ready to use when the winter operation is completed in Bakersfield. Therefore, the attributes of the Goldstone Allotment are also optimal for this grazing operation. There is a 1991 BLM Grazing Decision and USFWS Biological Opinion on the Superior Valley and Goldstone allotments that prohibits grazing.

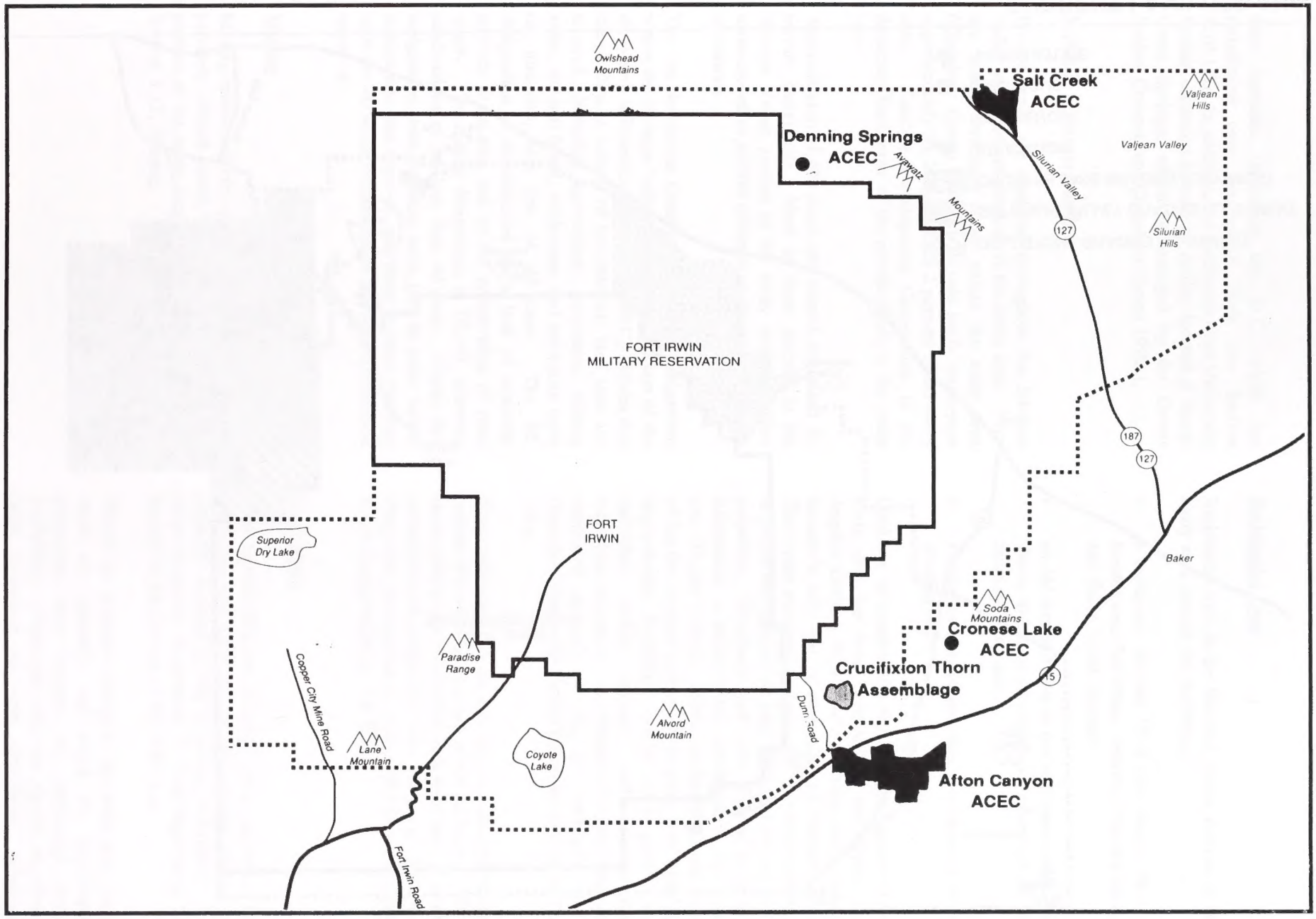
The Cronese Lake Allotment is leased to a private company in Newberry Springs that has the grazing privileges (1,508 AUMs) on 54,250 acres of public land and leases 6,720 private and 320 state acres. This allotment has been classified as an ephemeral/ perennial range for cattle use. This range type is a combination of ephemeral range as described above and perennial range where woody shrubs and bunch grasses are the major livestock forage. For perennial range, forage production is more constant from year to year so that no production verification is required prior to grazing use. For this allotment, the lessee uses a baseline allocation from the perennial forage and is allowed use of ephemeral range as available on a 2-year basis. The lessee uses this allotment for cattle grazing year-round.

3.10.2.2 State Lands

State lands generally appear as a checkerboard pattern throughout the Silurian Valley and southern portions of the study area. These lands comprise approximately 21,552 acres (3.4 percent) of the study area and are mostly undeveloped. They are administered by various

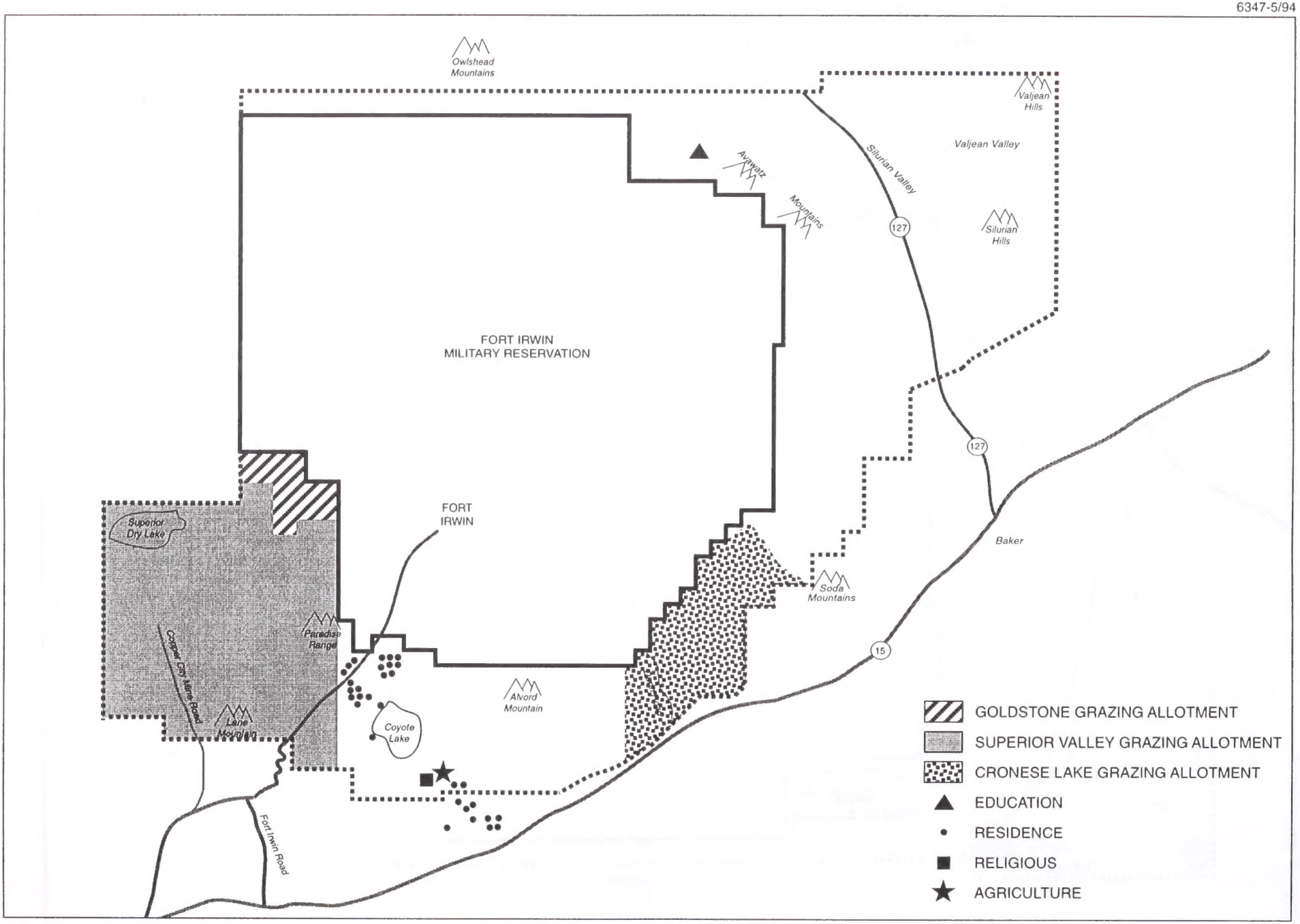


BLM MULTIPLE USE CLASSES
Figure 3.10-2



AREAS OF CRITICAL ENVIRONMENTAL CONCERN AND UNUSUAL PLANT ASSEMBLAGES

Figure 3.10-3



CURRENT LAND USE AND GRAZING ALLOTMENTS
Figure 3.10-4

state agencies, including the SLC, which has jurisdiction over the school lands (see Section 3.10.1.2). In addition, the California State University System maintains a research facility located at Sheep Creek Springs, which is managed by the Desert Studies Consortium (Chambers Group 1992c).

3.10.2.3 Private Lands

Private lands are scattered throughout the Silurian Valley and southern portions of the study area. Very few actual dwellings occur within the study area (Chambers Group 1992c). Private lands encompass approximately 95,217 acres (15.2 percent of the study area). Catellus Development Corporation is the dominant landowner of the private lands in the study area.

Approximately 4,480 acres are owned or leased by private individuals. Most of these parcels in the Silurian Valley portion of the study area are either undeveloped or exhibit evidence of abandoned mining operations.

The San Bernardino County General Plan designation within the Silurian Valley and southern portion of the study area is Resource Conservation (RC). Under this designation, a variety of low-intensity land uses are allowed, including agricultural, croplands, mining areas, national forest, wilderness, and residential units on minimum size lots of 40 acres. The RC designation is characterized by a lack of available services to an area and by the preservation of open space. The zoning designation is DL-40, allowing subdivisions of no less than 40 acres. Under this designation, two dwelling units per 40 acres would require site plan approval, and three or more dwelling units per 40 acres would require planning commission approval.

Mining

Mining-related activity occurs on several parcels of privately owned lands within the Silurian Valley portion of the study area and is further discussed in Section 3.12, Mining.

Residential Uses

Residential uses in the Silurian Valley portion of the study area include the following:

- a residence, labeled "Bob and Ward's Place," located near Salt Basin, between Denning Spring and Sheep Creek Springs,
- an old structure that is not well maintained, but shows evidence of recent use observed in the Silurian Hills, and
- a newer residential structure also observed in the Silurian Hills.

Land use information for the southern portion of the study area has been compiled by the Corps, Los Angeles District, Real Estate Division, using county assessor's rolls and is current as of October 1996. The county assessor's rolls are the best existing source of public information but may fail to list all improved properties. Residency data were mapped from this information to show current residences in the study area (Figure 3.10-4). Thirty residential parcels exist within the southern portion of the study area including single-family dwellings, mobile home parks (and individual mobile homes), and miscellaneous residential structures. An example of a miscellaneous residential structure is the St. Anthony Coptic Orthodox Monastery located southeast of Coyote Dry Lake.

Nine residential parcels are located adjacent to and outside of the southern portion of the study area. They are located south of the study area boundary, near the powerlines and north of Harvard. Although not in the study area, their proximity to the affected environment merits consideration in this EIS.

Agriculture

Most lands within the Silurian Valley portion of the study area are not suited for agricultural production primarily because of lack of water availability. No prime farmlands of statewide or local importance are located in this portion of the study area.

Within the southern portion of the study area, most lands are generally not suited for agricultural production also because of constrained water availability. Occasional crops are planted on private lands depending on water availability, economic

variables of the landowner, and market supply and demand (SCS, personal communication 1988). The proper combination of these variables can, in fact, provide a foundation for the establishment of good agricultural crop production; however, water is a limiting factor in this area. No prime farmlands of statewide or local importance are within the southern portion of the study area (SCS, personal communication 1988). One 320-acre agricultural area (Figure 3.10-4) that has recently been used for crop production is found within the study area. Field surveys conducted in January 1989 indicated that this area was not used for crop production in 1988.

Uses by Religious Organizations

The St. Anthony Coptic Orthodox Monastery is located southeast of Coyote Dry Lake and within the southern portion of the study area (Figure 3.10-4). The monastery is occupied by members of the Coptic Orthodox Church nationwide and encompasses 20 acres of land. According to Ghobreial (1988), the monastery "represents the source of inspiration and the driving force behind the existence of the Coptic Church." The monastery includes three primary structures within the property boundaries, two of which are apparently used for worship and housing quarters. The structures are approximately 1,000 square feet each. The third structure is a supply or equipment shed that is approximately 400 square feet. His Holiness, Pope Shenouda III, consecrated the Coptic Orthodox Monastery on church-owned property in November 1989.

The Coptic Orthodox Church can trace its history back to the early centuries of Christianity and to the geographical area of northeast Africa. The denomination is historically known for its remote desert monasteries. The land was purchased in 1973 by the Coptic Orthodox Church, and later the church made improvements and constructed buildings that now make up St. Anthony's Monastery. Presently, only one monk is in residence, and the monastery is reported to serve more as a retreat center for the 50,000 Coptics living in southern California (U.S. Army Forces Command [FORSCOM] Staff Chaplain Office 1989).

Other Uses

The Desert Studies Consortium maintains a small cabin at the Sheep Creek Spring, which is available for lodging to researchers and the general public on a first-come-first-serve basis.

A transmitting station is located near Avawatz Crown Mine above Old Mormon Springs.

Little Dumont Dunes, on the northeastern border of the study area site, shows evidence of frequent OHV use.

3.10.3 Adjacent Land Uses

Most of the lands in the region are part of the CDCA and are under direct federal (BLM) control. Death Valley National Park is located north of the study area and is administered by the Department of the Interior, National Park Service. Adjacent to the Silurian Valley are the mostly undeveloped lands of the Kingston Range to the north and the Shadow Mountains and Shadow Valley to the east. Further beyond is the Clark Mountain Range in the easternmost part of San Bernardino County. Inyo County and Clark County, Nevada, lie to the north and east, respectively. Baker is located due east of the study area at the intersection of I-15 and State Highway 127.

I-15 lies just outside the southern boundary of the study area, separating it from the Mojave River and the Cady Mountains. Most of the developed areas in the vicinity of the study area are located south in the Mojave Valley. These developed areas include the communities of Harvard and Barstow, and the U.S. Marine Corps Supply Center at Yermo. The Calico Mountains and the restored ghost town of Calico lie to the southwest.

3.10.4 Environmental Justice

Executive Order 12898 requires federal agencies to implement policies and conduct programs and activities that could substantially affect human health or the environment so that there are no disproportionately high and adverse human health or environmental effects on minority or low-income populations.

As discussed above, residential uses in the study area are relatively scarce. Because of this low residential population, no demographic sector of the population is disproportionately represented in the study area. No activities traditional to one or more ethnic groups or low-income populations dominate the landscape.

3.11 RECREATION

The study area contains public lands open to local citizens and tourists for recreational pursuits such as camping, rockhounding, horseback riding, land sailing, OHV use, and sightseeing. With the exception of organized recreation events, these recreational activities can be pursued without government permits. In other words, BLM public lands provide for a relatively unconstrained public lands experience. BLM guidelines for OHV use are applied to public lands within the study area. The study area's proximity to the communities of Barstow, Yermo, and Newberry Springs makes it an area used by local citizens for recreational pursuits.

Millions of southern California residents use the CDCA annually. Many of these persons travel to the Barstow area to explore the adjacent desert wildlands. The BLM's best estimate for recreational use in the Rainbow/Superior Recreation Management Area for 1990 was 45,700 visitors and 219,490 hours of use for the year. Because different activities vary in duration of use, the BLM catalogs hours, in addition to numbers of visitors. The Rainbow/Superior Recreation Management Area is located adjacent to and southwest of the study area. Uses by activity for the area were estimated as follows: 12,500 camping visitors, 12,000 OHVs, 7,500 touring, 2,000 nonmotorized (equestrian), 10,500 land-based visitors, and 1,200 hunting visitors (see Table 3.11-1). Visitor use disperses from the Rainbow/Superior destination area into the study area because users may camp at the Owl Canyon Campground within the Rainbow Basin area or choose to expand day-trip destinations to the vicinity. Actual visitor use within the study area is less than that documented to occur within the Rainbow site.

Guided tours through the NTC are provided through the Desert Explorers Program or upon group requests. These tours are arranged in advance in accordance with the military training schedule. Tours are also arranged upon requests to accommodate research activities. The following discussion of recreation resources is based on site visits, interviews with recreation organizations that identified themselves during the scoping period, and BLM visitor use statistics.

The area attracts recreationists (Figure 3.11-1) because of its remoteness and locational attributes. Getting away from urban areas or work-related pressures to the quiet desert landscape offers unique social relaxation. Sightseeing, equestrian, and OHV participants choose this location because of the opportunity to be separated from nearby populations. The social characteristics of a remote location produce a "sense of peace" and a unique experience within a natural desert environment. Conversely, organized events, such as the America's Cup of Land Sailing, offer individuals opportunities for interaction with others of similar interests.

Table 3.11-1

1990 RECREATIONAL USES OF RAINBOW/SUPERIOR RECREATION MANAGEMENT AREA

Type of Use	Number of Visitors	Visitor Hours
Camping	12,500	137,500
OHV	12,000	33,000
Other motorized vehicles/ sightseeing	7,500	13,500
Nonmotorized (equestrian)	2,000	7,200
Hunting	1,200	4,140
Land Based (rockhounds, wildlife observation)	10,500	24,150
Total	**45,700**	**219,490**

Source: BLM Recreation Information Management System, California State Office, California. BLM 1990

The economic benefits to adjacent communities differ between organized recreation events and unstructured, dispersed recreational activities. These recreational activities associated with the study area are a source of noticeable and stable economic value to desert communities. Specific quantification of recreational economic benefits would be speculative, however.

3.11.1 Land Sailing

Land sailing is a recreation activity that depends primarily on the use of dry lakebeds, particularly the Superior Dry Lakes located near the western boundary of the study area (Figure 3.11-1). Superior Dry Lakes 1 and 3 to the east and west, respectively, offer remote accessibility (necessary to discourage

competing activities on the lakebed), appropriate surface conditions (generally smooth, lacking wheel tracks or excavations), and large spatial characteristics that are required by the design and nature of this sport. According to the North American Land Sailing Association (NALSA) (1988), an appropriate dry lake must offer at least 2 square miles of open land in its natural state (land sailing vehicle speeds may reach 100 mph). Coyote Dry Lake offers the special attributes required by land sailing participants; however, the lake does not have the smooth surface necessary for land sailing. Land sailing occurs at the Silurian Dry Lake. While opportunities for land sailing exist at this dry lake, the BLM estimates that recreational use is less than 50 visitor-use-days annually with fewer than 200 annual visits for all recreation purposes.

Superior Dry Lakes 1 and 3 are used by NALSA and other organizations and are recognized as two of the best dry lakes in North America for land sailing. Superior Dry Lake 1 lies within the study area at the northern edge of public lands in Superior Valley, which is accessed at the northern end of the Copper City Mine Road. Copper City Mine Road is a gravel road regularly maintained by the County of San Bernardino. This dry lake is considered optimum because of its accessibility; large vehicles and trailers can access the area easily. Superior Dry Lake 3 is located outside of the study area, west of Superior Dry Lake 1 and the study area boundary. Access to Superior Dry Lake 3 is provided by the Copper City Mine Road and about 8 additional miles of unimproved and unmaintained dirt track. Recently, debris and tire ruts have decreased the quality of land sailing available at Superior Dry Lake 3.

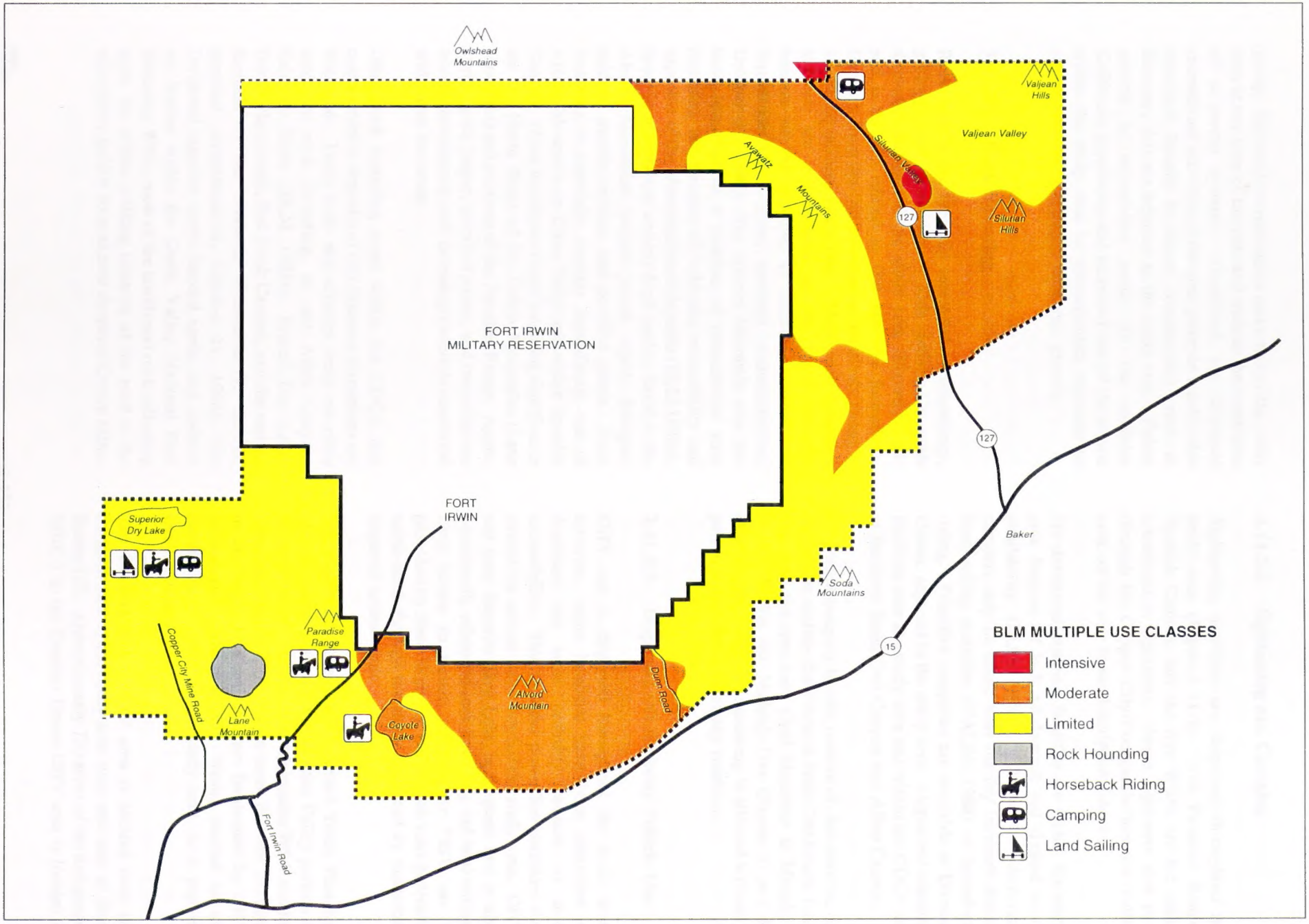
The America's Cup of Land Sailing has been held at either Superior Dry Lake 1 or 3 approximately every other year since 1969 during Easter week. During the America's Cup, up to 800 land sailors from the United States, Canada, and Mexico participate in the land sailing competitions (NALSA 1992). Various other land sailing organizations (Pacific Land Yacht Club, Wind Wizards, Manta Association, Nord and Broden, and American Land Sailing Federation) use the Superior Dry Lakes for organized events throughout the year. Each event typically draws approximately 50 to 100 people, and these groups organize approximately 15 events per year (NALSA 1992). Superior Dry Lake 1 is also used by NALSA annually for land sailing on Halloween weekend for unstructured events. Land sailors can be found at the Superior Dry Lake 1 location practically every weekend, especially the holiday weekends from fall through spring.

It is anticipated that future uses of dry lakebeds will include increased ultralight and experimental aircraft use. The large areas provide adequate takeoff and landing space generally unobstructed by other uses. Other uses that will probably increase in the foreseeable future are remote-controlled models, both terrestrial and airborne, and windboarding, where sails are attached to skateboards rather than surfboards.

Other dry lakebeds within the CDCA are dispersed, and only a few possess the attributes required for land sailing. Cuddeback and Harper Dry Lakes to the west and southwest of the study area, respectively, are spatially acceptable but are not suitable for land sailing because of surface damage caused by OHV use and agricultural runoff (E. Braslow, NALSA, personal communication, September 29, 1988). Few lakes have the right kind of surface for land sailing. El Mirage Dry Lake is suitable for land sailing, but other intensive recreation uses of this lakebed limit the available area for land sailing. Silver Lake is within the boundaries of a WSA, and no mechanized vehicles are allowed. Searles Dry Lake, northwest of the study area, lies adjacent to Highway 178, but is suitable only for smaller land-sailing vessels. Because of high speeds reached by the larger vessels, the rough surface of this lake makes it unsuitable for use by larger vessels. Ivanpah Dry Lake is located outside of the study area to the east on the California-Nevada border near I-15. This lake is used by NALSA annually on Thanksgiving weekend. Other than Superior Dry Lake 1, Ivanpah is the only other dry lakebed within the CDCA that offers quality land-sailing conditions to all types of land-sailing vessels and organized events (E. Braslow, NALSA, personal communication, September 29, 1988).

3.11.2 Dispersed Recreational Activities

In contrast to events and activities such as land sailing, dispersed recreational uses are not focused on a single location but occur on a scattered basis throughout much of the CDCA public land. Dispersed recreation activities include rockhounding, OHV use, sightseeing, camping, hunting, hiking, and horseback riding. Dispersed recreation use is less intense in the study area than in the Rainbow Basin area. Most dispersed recreation use occurs west of Fort Irwin Road. As a



RECREATION USE
Figure 3.11-1

group, dispersed recreationists make use of the study area at any time of the year and without the constraints of a permit system. Combined, the dispersed recreational activities of the area generate a noticeable economic benefit to desert communities, such as Barstow, that are adjacent to the study area. Future growth in recreational needs for the southern California population and increased use of the region within the study area by recreationists represent an opportunity for community economic growth.

3.11.2.1 Rock Hounding

Rock hounds are typically interested in mineralogy, geology, and gemology. This activity is quite dispersed throughout the study area (Figure 3.11-1) and is usually related to Old Miocene formations. Deposits from the Old Miocene are relatively young at 14 to 26 million years old. Most rock hounding interests are concentrated on the young deposits because of the selection of brilliant, unweathered formations (J. Collins, personal communication, October 21, 1988). The Alvord Mountain area has been identified as a location of concentrated rock hounding use because of vehicular accessibility and exposure of the aforementioned deposits (BLM 1988c). Specific materials of notably high quality found in the Alvord Mountains include jasper, agate, feldspar, epidote, azurite crystals, and petrified palms. Rock hounding is especially popular immediately east of Alvord Mountain on Clues Ridge and within Spanish Canyon. Other locations of rock hounding significance are the North Slope of the Calico Mountains (Lane Mountain) and portions of the Paradise Range. Agate, pyrite, gold, jasper, petrified palms, and travertine are among the common rock hounding materials associated with these two areas.

Other rock hounding areas within the CDCA that contain similar deposits of Old Miocene formations are dispersed. Lavic Lake and adjacent areas are often used for rock hounding, as are Afton Canyon, Rainbow Basin (BLM 1988e), Bristol Dry Lake, Devils Playground, Red Rock Canyon, and the eastern foothills of the Avawatz Mountains (J. Collins, personal communication, October 21, 1988). The Owlshead sagenite agate, banded agate, and nodules are hunted within the Death Valley National Park Boundary WSA; most of the traditional rock collecting areas are within walking distance of the road to the microwave facility located near Avawatz Crown Mine.

3.11.2.2 Sightseeing and Camping

Sightseeing activities are dispersed throughout the study area (Figure 3.11-1). The Paradise Range, Spanish Canyon, and the five WSAs are the major attractions to sightseers. Some sightseers also pass through the Copper City/Coolgardie/Superior Valley area on the way to see Inscription Canyon.

No developed camping facilities are within the study area because of lack of demand and limited water availability (BLM 1988c). However, dispersed campers may be found near the dry lakebeds during land sailing activities (NALSA 1988) or horseback riding. Primitive campsites are available at Dumont Dunes, adjacent to the study area. Organized camping facilities near the study area and within the CDCA are at Rainbow Basin/Owl Canyon and Afton Canyon.

Dispersed camping locales outside of, but near to, the study area include the Fremont Peak/Cuddeback Lake area and the area near Opal Mountain at Murphy's well. Within the Multiple-Use Classes L and M affecting the study area, camping is allowed without a permit within 300 feet of any roadway.

3.11.2.3 Dispersed Off-Highway Vehicle Use

OHV use is dispersed throughout the study area; however, some localities have been identified as dominant use areas probably because of their accessibility. This includes powerline corridors that extend for several miles beyond the study area. OHV use near Superior Dry Lake is frequent and is also occasionally related to rock hounding and land sailing. Easy access to terrain suitable for OHV use is provided by State Highway 127, which runs generally north-south through the study area, and by numerous unpaved access roads.

The California Statewide Motorized Trails Plan has several routes that cross the Silurian Valley portion of the study area. The Avawatz Mountains WSA and the Kingston Range WSA contain areas that are included in the Trails Plan and that are frequented by OHV enthusiasts. The Kingston Wash, located in the northeastern corner of the study area, is a popular OHV touring route.

The Dumont Dunes OHV area is located near the northern end of the study area west and east of State Route 127. Approximately 730 acres of the designated MUC I in the Dumont Dunes OHV area is located in

the northern portion of the study area. A portion of the area referred to as the Little Dunes is also located within the study area. Since the 1960s, the Dumont Dunes has attracted people to the challenge of dune riding. In the last 10 years, vehicle-based recreation has increased. Every weekend from October through May, visitors come to Dumont with their motorhomes and all-terrain vehicles (ATVs) or sand rails. The area attracts 60,000 visitor-use days per year with about one-third of all users coming from southern Nevada and two-thirds coming from southern California. The area is classified as Multiple-Use Class I, allowing for this intensive use. Visitation to the Dumont Dunes is expected to continue to increase steadily at 5 percent per year.

OHV use within the study area appears to be related to seasonal climatic conditions. For example, the valleys are used mainly in the spring and fall when ambient temperatures are pleasant in unsheltered open areas. Similarly, in the summer, OHV use appears to be concentrated at higher elevations where the air temperatures are relatively cooler.

Dispersed OHV use within the CDCA is a popular recreational activity and is pursued by those riders who wish to avoid the more intensive OHV activity at OHV open areas. Limited and Moderate Use Multiple-Use classifications within the study area limit OHV users to traveling on designated routes, which generally include existing roads and trails on public lands. Adjacent private lands are sometimes also used while the rider uses these existing roads. The Manix railway area, adjacent to the study area, is easily accessible to motorcycles and ATVs. This area is very popular for OHV use during holiday weekends. Other comparable dispersed OHV use areas near the study area include the Opal Mountain, Blacks Canyon, and Fremont Peak vicinities.

3.11.2.4 Horseback Riding

Horseback riding within the study area occurs through organized and unstructured events. Equestrian groups, such as Equestrain Trail, Inc. (ETI), use numerous locations within the study area (Figure 3.11-1) for organized events. The entire study area is considered unique for horseback riding because of the hot springs (Paradise Springs) and relatively smooth terrain for horse travel. ETI presents two major rides annually during a predetermined 3-day weekend. These rides usually involve more than 100 riders each and follow either Black Canyon to Superior Dry Lake, or Owl Canyon to a plateau between Mud Hills and Lane Mountain.

ETI also offers shorter rides to Coyote Dry Lake and Paradise Springs and various rides throughout the Alvord Mountains. The shorter rides usually involve approximately 30 riders each, two times per month. Events are also organized to introduce riders to the historical trails within and outside of the study area. ETI reports that it provides the riders with an introduction to the area, with the intent of showing riders new places to visit (L. Dudney, personal communication, October 6, 1988).

Equestrian visitor use figures were not calculated for the Rainbow/Superior Recreation Management Area described previously in this section. However, use is estimated, based on information provided during the public scoping period, to approach other nonmotorized uses that were tallied.

Horseback riding areas within the greater CDCA are well dispersed. Areas of most use include Afton Canyon, the foothills of Apple Valley, Death Valley, and adjacent to the Colorado River. Many organized rides use the areas from Ridgecrest to Furnace Creek, Juniper Flats to Big Pine Flats, and from Needles to Yuma (parallel to the Colorado River). The southern portion of the CDCA also offers many horseback riding opportunities, including the Santa Ana River Bottom Trail Corridor, Woodcrest, and Indio (E. Clupper, Riverside County Department of Parks and Recreation, personal communication, September 29, 1988).

3.11.2.5 Hunting and Shooting

Hunting within the study area is related to the presence of small game, such as Gambel's quail, chukar (grouse), dove, jackrabbits, and cottontail rabbits (BLM 1988c). Whereas ground animals are hunted throughout the area, the fowl are usually stalked within mountainous terrain. As a dispersed recreation activity, hunting is not limited to specific sites. However, in some areas, such as the Calico Mountains, Salt Creek ACEC, the Kingston Wash area, and portions of the Avawatz Mountains (Figure 3.11-1), hunting activity becomes concentrated because of prime small-game habitat. Hunting areas within the greater CDCA are well dispersed and are also related to game distribution (BLM 1988e).

In the context of this document, shooting has been defined as a recreational activity using a firearm directed toward an inanimate object (e.g., target shooting). Therefore, game hunting is excluded from this discussion. Shooting within the study area is a low-intensity recreation use that usually occurs near roadsides because of the advantages of accessibility (BLM 1988c). No organized shooting events are held within the study area.

3.12 MINING

Detailed aspects of the geology in the study area may be obtained from Dokka (1990); Spencer (1986); Rehrig (1986); Brady, Troxel, and Butler (1980); Streitz and Stinson (1974); Troxel (1967), Wright and Troxel (1966); Jenning, Burnett, and Troxel (1962); Kupfer (1960); Grose (1959); and Jahns (1954).

Mineral resources and deposit descriptions are discussed by McMahan, Rice, and Sokaski (1985); Koch and Ach (1984); Wright (1968); Goodwin (1957); Ver Planck (1957); Wright et al. (1954); Cordell (1953); Wright, Stewart, Gay, and Hazaenbush (1953); and Tucker and Sampson (1943). Vredenburgh (1981) studied the Avawatz Mountains resources as a part of the BLM's GEM program.

Much of the mining history of the study area is summarized in mineral resource evaluations by Alderman (1993, 1989, 1988, and 1986).

The study area is comprised of approximately 625,920 acres of federal (public domain), state, and private lands. Most of the lands are federal and managed by the BLM, which has a policy of encouraging exploration and development of mineral resources on multiple-use lands under its jurisdiction. Similarly, the SLC administers a leasing program to encourage mineral exploration and development of many state-owned lands. The largest private landowner, the Catellus Development Corporation (Catellus), permits third-party mineral exploration and development on many of its holdings using rights-of-entry and leases.

Mineral commodities are classified under federal law into three distinct groups: locatables, leasables, and salables. Locatable minerals are commodities that, when found in valuable deposits on unreserved public domain land, can be acquired under the General Mining Law of 1872, as amended. Examples of locatable minerals occurring on public lands within the study area include, but are not limited to, minerals containing gold, silver, tungsten, copper, lead, uranium, and zinc. Uncommon varieties of limestone and other materials having unique and special values, such as zeolites and wollastonite, are also locatables.

Under the General Mining Law, U.S. citizens have a statutory right to explore vacant, unreserved federal public land for mineral resources. If a valuable deposit is found, a citizen has a right to locate, mine, and remove the minerals. Prospecting and development involving extensive land disturbance are regulated by the BLM within the study area. Mining and reclamation plans are reviewed by the BLM for compliance with applicable federal and state laws. Conditions and stipulations may be added to prevent unnecessary degradation of the public lands or nonmineral resources.

Restoration and reclamation measures may also be required to mitigate for large excavations and related site impacts.

Leasable minerals are those commodities that may be acquired of federal public lands under the Mineral Leasing Act of 1920, as amended. Within the study area, leasables potentially include sodium borate and all minerals except salables occurring on acquired lands. Leasables are subject to exploration and development through leases, permits, or licenses issued by the BLM.

Salable minerals, which include common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay, have widespread occurrence within the study area. These commodities have relatively low unit value, but may have high bulk commercial or industrial value and importance depending on their proximity to markets. Salables in a given location can take on even greater importance if alternative sources of supply become limited due to depletion or incompatible land uses that prevent access. Salables are used chiefly for roadways and other construction and are disposed of at the discretion of the BLM by contract or permit. One of the largest consumers of salables in the study area is the State of California Department of Transportation (CalTrans), which uses the materials for highway maintenance.

Prior to completion of large withdrawals (more than 5,000 acres) of public domain land from mineral entry, Section 204(c) of the FLPMA requires that a mineral report be prepared. The purpose of a minerals report is to assess the resource potential of known mineral deposits and to evaluate the potential occurrence of yet undiscovered mineral deposits within the proposed withdrawal or study area. The minerals report must include information on geology, known mineral deposits, past and present mineral production, mineral interests in the area, and consideration of market demand and potential economic activity.

San Bernardino County has a long history of mining activity. Since the 1860s, there has been extensive surface prospecting in the study area, both by individual prospectors and by mining company geologists. Broad-based mineral exploration of the area, which included geologic mapping and identification and delineation of specific geologic units, was conducted by Southern Pacific Company (corporate predecessor of Catellus) and the California Division of Mines and Geology. Many of the known mineral occurrences within the study area were identified during Southern Pacific's studies conducted in the 1950s and 1960s.

To date, mineral potential of the study area has been addressed primarily on a regional basis rather than in the context of specific mountain ranges or basins. In coordination with the Corps, the U.S. Bureau of Mines (BOM) conducted preliminary analyses of the Fort Irwin Margin Area (non-Silurian Valley lands) in 1989 to associate selected mineral occurrences with geologic terrains. Terrains are defined as grouped assemblages of geologic formations that are of roughly similar origin and history and tend to host similar types of mineral deposits. Comparable studies of the Silurian Valley were conducted by the BOM in 1993. Extensive field verification for accuracy was not performed by the BOM during the earlier study, and further inventory and data analysis were necessary to complete the assessment of study area. Many mines and significant areas of substantial past and present prospecting activity were visited and sampled during 1992 and 1993. Some geologic mapping was also performed.

In both of the BOM studies, the potential for new deposits of selected commodities was evaluated by comparing the inventory of reported occurrences and their geologic environments with mineral deposit occurrence models developed for the Mojave Desert region and elsewhere. Guidelines and procedural criteria regarding "Mineral Potential for Occurrence Classification," set forth in BLM Manual 3031, Energy and Mineral Resource Assessment (BLM 1985), were used to assess the potential for geologic terrains to host Category I Commodities, Category II Commodities, and construction materials. Category I Commodities are those metallic and nonmetallic minerals that are either strategic, energy related, or mainly imported, or occur in significant amounts in the CDCA. Category II Commodities are those commodities not known to occur in important amounts in the CDCA. Table 3.12-1 summarizes the BLM's mineral potential classes used in this study.

Preliminary mineral estate gross appraisals of the southern portions of the study area were conducted in 1986, 1988, and 1989 (Alderman 1986, 1988, 1989). The Silurian Valley and lands north of Fort Irwin were similarly investigated in 1992 and 1993 (Alderman & Slothower 1993). In addition to confidential valuation information regarding known mineral interests, the appraisal reports presented information on regional geology and mineral resources, as well as past and present mining activities. Following extensive investigation of records, files, and reports of the USGS, BLM, State Lands Commission, California Division of Mines and Geology, County of San Bernardino, and the Southern Pacific Land Company/ Catellus Development Corporation, identified mineral holdings were visited and cursorily examined as part of the gross appraisal process.

3.12.1 Mineral Deposits

The Mojave Desert Region has a large, complex variety of rock types and geologic terrains for hosting mineral deposits. The BLM has also classified portions of the study area as potentially valuable for leasable sodium, geothermal, and oil and gas resources. Table 3.12-2 depicts the geologic terrains in the study area and the expected mineral resources, along with several minerals not known to specifically occur within the Fort Irwin Margin Area or the Silurian Valley, but which are present in the Mojave Desert Region. A few commodities, mainly construction materials, have widespread variable occurrence. For example, deposits of decorative stone can be found in any geologic terrain with appropriate localized conditions of color, jointing, and weathering.

Table 3.12-3 lists 36 commodities that the federal government has identified as either strategic or critical. Thirty-one of these commodities are on the National Defense Stockpile List, and at least 18 are known to occur within or in the vicinity of the study area.

3.12.2 Mining History

Serious prospecting activity began in San Bernardino County in 1860 with the discovery of gold in the San Bernardino Mountains. During the next decade, several significant and well-publicized mineral discoveries in the Mojave Desert region lured prospectors to the high desert in search of mineral wealth. The first silver discovery circa 1875 was near

Table 3.12-1

BLM MANUAL 3031 MINERAL POTENTIAL FOR OCCURRENCE CLASSIFICATION

Potential	Description	Assigned Levels of Certainty[1]
High (H)	The geologic environment, the inferred geologic processes, the reported mineral occurrences and/or valid geochemical/geophysical anomaly, the known mines or deposits indicate high potential for accumulation of mineral resources. The "known mines and deposits" do not have to be within the area being classified, but have to be within the same type of geologic environment.	H-B, H-C, H-D
Moderate (M)	The geologic environment, the inferred geologic processes, and the reported mineral occurrences or valid geochemical/geophysical anomaly indicate moderate potential for accumulation of mineral resources.	H-A, M-B, M-C, M-D
Low (L)	The geologic environment and the inferred geologic processes indicate low potential for accumulation of mineral resources.	M-A, L-A, B, C, and D
Zero (0)	The geologic environment, the inferred geologic processes, and the lack of mineral occurrences do not indicate potential for accumulation of mineral resources.	Not applicable
Not determined (ND)	Mineral(s) potential not determined because of lack of useful data. This notation does not require a level-of-certainty qualifier.	Not applicable

[1] **Levels of Certainty defined:**

- **A - The available data are insufficient and/or cannot be considered as direct or indirect evidence to support or refute the possible existence of mineral resources within the respective area.**
- **B - The available data provide indirect evidence to support or refute the possible existence of mineral resources.**
- **C - The available data provide direct evidence but are quantitatively minimal to support or refute the possible existence of mineral resources.**
- **D - The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources.**

the town of Calico, located northeast of Barstow, and gave rise to the Calico mining district. Although the district lies chiefly out of the study area, many fringe prospects overlap the study area's southern boundary. Exploration in earnest began in the Calico mining district in 1880, and a "silver rush" soon followed in the autumn of 1882. Over the next 14 years, the district produced an estimated $13 to $20 million in silver before ores were depleted in the shallow veins.

The Alvord Mine, in the south-central portion of the study area, produced about 5,000 ounces of gold before operations finally ceased in 1952. The Goodwater Mine (formerly known as the Crackerjack Bonanza), located 30 miles northwest of Baker, was mined around the turn of the century with activity ceasing around 1910. The Coolgardie dry-placer mining district, in the southwesternmost portion of the study area, became active in 1900, producing some $100,000 in gold during the next 15 years. The Goldstone District, north of the Coolgardie, was discovered in 1915 and produced gold for 3 years. Notable producers in the Goldstone District were the Belmont Mine, the adjoining Merrick Mine (Gold Crown Group), the Uncle Sam Mine, and the Big Four Mine. Southeast of Goldstone are the Reward Mine, Rio Hondo Mine, and Gold Divide Mine, all of which have had early production. The Olympus Mine, a low-grade gold producer approximately 19 miles northeast of Barstow, produced sporadically from 1915 to 1925. When the price of gold increased during the early 1930s, exploration in the region accelerated and the Olympus Mine reopened, but significant precious metal production from that mine never materialized.

Prospecting in the pre-World War I period led to the discovery of iron at Iron Mountain in the eastern portion of the study area. The deposit was mentioned in 1910 literature as one of the principal iron-ore deposits in California. The Iron Mountain deposit was drilled by the BOM and sold by Colorado Fuel & Iron to Kaiser Steel, which mined part of the ore body for

Table 3.12-2

REGIONAL POTENTIAL SUMMARY

Commodities	Potential Host Geologic Terrains[1]							Strategic or Comments
	Quaternary Sediments	Tertiary Sedimentary Rocks	Tertiary Volcanics	Tertiary Intrusives	Mesozoic Granitic Rocks	Paleozoic (undivided)	Precambrian	
CATEGORY I								
Copper	O	L-B	L-B	L-B	M-B, C	M-B, C	L-B	M potential in skarn environments. No major known deposits.
Gold	M-C	H-B, C to M-B, C	H-B, C to M-B, C	H-B, C to M-B, C			M-B, C to L-B, C	M-C in Quaternary sediments downstream from gold favorable terrains.
Iron	O				M-B, C, D	M-B, C, D	M-B, C, D	At contacts of Paleozoic or Precambrian with Mesozoic granitic rocks.
Lead	O	L-B, C	M-B, C, D	M-B, C, D	L-B, C	L-B, C	L-B, C	Also M-B, C, D near Paleozoic-Mesozoic granitic rocks.
Lithium	L-C, D	M-B, C	L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	
Manganese	L-C, D	L-C, D	M-C, D	L-C, D	L-C, D	L-C, D	L-C, D	Small deposits only in Tertiary igneous rocks.
Molybdenum		L-C, D	L-C, D	L-B, C	L-B, C	L-B, C	L-B, C	
Rare Earths		L-A, B	L-A, B	L-A, B	L-A, B	L-A, B	M-A, B	
Tungsten					H-C, D	H-C, D	H-C, D	High potential as skarn deposits at Paleozoic-Mesozoic granitic rock contacts. Mode rate potential at Precambrian-Mesozoic granitic rock contacts.
Vanadium		L-D	L-D	L-D	L-D	L-D	L-S	No occurrences known in area.
Zinc		L-C, D	M-B	M-B	M-B	M-B	L-C, D	Moderate potential as skarns where Mesozoic granitic rock intrudes Paleozoic carbonates and in veins in tertiary igneous rocks and Tertiary intrusives.
Asbestos		L-D	L-D	L-D	L-D	L-D	L-D	No occurrences known. No ultramatic rock in area.
Barite			L-C	L-C				Deposits occur as veins, but these veins are rarely economic.
Borates	M-C, D	M-C, D	L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	
Calcium Salts	M-C, D	M-C, D	L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	
Fluorite	O		M-C	M-C				No occurrences known.
Graphite		L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	No occurrences known.

Table 3.12-2

REGIONAL POTENTIAL SUMMARY

Commodities	Potential Host Geologic Terrains[1]							Strategic or Comments
	Quaternary Sediments	Tertiary Sedimentary Rocks	Tertiary Volcanics	Tertiary Intrusives	Mesozoic Granitic Rocks	Paleozoic (undivided)	Precambrian	
Gypsum	M-C, D	M-C, D	L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	
Hectorite (magnesium bentonite)		H-B	H-B					
Kyanite						L-C		No occurrences known. Potential Paleozoic pelitic rocks.
Mica	L-B	L-B	L-B	L-B	L-B	M-B	L-B	No commercial occurrences known, except mica sericite and M-B in Paleozoic pelitic rocks.
Pyrophyllite						L-B		No occurrences known. L-B in Paleozoic pelitic rocks near Mesozoic granitic rock intrusives.
Silver	H-D	H-D	H-D					H-D in Calico area. H-B in Tertiary areas elsewhere.
Strontium	M-C, D	M-C, D	L-C, D	L-C, D	L-C, D	L-C, D	L-C, D	
Talc							M-B to H-D	In Precambrian carbonates near Mesozoic granitic rocks.
Tin					L-B	M-B to L-B		No occurrences known. Potential as skarn near Mesozoic granitic rocks.
Titanium	L-C	L-C	L-C	L-C	L-C	L-C	L-C	No occurrences known.
Wollastonite						M-D to H-C		In Paleozoic carbonates near Mesozoic granitic rocks.
Zeolites	M-C to H-D	M-C to H-D						Possibly in Quaternary sediments.
CATEGORY II								
Abrasives							L-B	No occurrences in Precambrian near Mesozoic granitic rocks.
Antimony			L-B to M-C	L-B to M-C				No occurrences known in Paleozoic near Mesozoic granitic rocks or in Tertiary igneous rocks near Tertiary intrusives.
Bentonite	M-C to H-D	M-C to H-D						Many occurrences, mostly subeconomic grade.
Feldspar		M-C						
Gemstones	M-C	M-C to H-D	M-C to H-D					Only opal reported.
Magnesite						M-C		M-C in Paleozoic carbonates near Mesozoic granitic rocks.

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Table 3.12-2

REGIONAL POTENTIAL SUMMARY

Commodities	Potential Host Geologic Terrains[1]							Strategic or Comments
	Quaternary Sediments	Tertiary Sedimentary Rocks	Tertiary Volcanics	Tertiary Intrusives	Mesozoic Granitic Rocks	Paleozoic (undivided)	Precambrian	
Mercury	M-B	M-B						Two occurrences near Tertiary intrusives.
Nickel		L-C	L-C	L-C	L-C	L-C	L-C	One minor occurrence known.
Perlite		M-C, D	M-C, D					
Silica							M-B	In quartzites of Precambrian.
Sulfur				L-B				No occurrences. L-B near Tertiary intrusives.
CONSTRUCTION MINERALS								
Cinders and Pumice	M-C to H-D	M-C to H-D						Locally in Quaternary sediment volcanics.
Clay	M-C to H-D	M-C to H-D	M-C to H-D					
Decorative Stone			M-C	M-C		M-C		Common, but quality rarely suitable.
Granules		M-C	M-C	M-C		M-C		Common, but quality rarely suitable.
Limestone/Dolomite						H-D		Common, but quality rarely suitable. In Paleozoic carbonates.
Riprap	M-C to H-D	M-C to H-D						Abundant in area.
Stone			M-B to H-D		M-B to H-D	M-B to H-D	M-B to H-D	Abundant in area, but only locally suitable for use.
Sand and Gravel	H-D	H-D						Abundant in area, locally in Tertiary sedimentary rocks.
Travertine		M-B, C						One occurrence.
ENERGY MINERALS								
Uranium		M-B, C	M-B, C	L-B	L-B	L-B	L-B	
Thorium		L-C	L-C	L-C	L-C	L-C	L-C	
Coal	L-C	L-C	L-C	L-C	L-C	L-C	L-C	
Oil and Gas	L	L	L	L	L	L	L	No post-Triassic marine rocks are known in the Fort Irwin withdrawal area, and older rocks are too severely deformed and metamorphosed to host petroleum or gas reservoirs.

[1] **See Table 3.12-1 for code identifications.**

Table 3.12-3

LIST OF STRATEGIC AND CRITICAL MINERALS AND METALS

Commodity	Strategic Rating		Commodity	Strategic Rating
Antimony	SX		Manganese	SX
Arsenic	X		Mercury	SX
Asbestos	SX		Mica (sheet)	SX
Barite	X		Nickel	SX
Bauxite and Alumina	SX		Platinum (group)	SX
Beryllium	S		Potash	SX
Bismuth	SX		Quartz Crystals	S
Cadmium	SX		Rutile	S
Chromium	SX		Silver	X
Cobalt	SX		Strontium	X
Columbium	SX		Talc, Steatite Block and Lump	S
Copper	S		Tantalum	SX
Diamond (industrial)	SX		Tin	SX
Fluorspar	SX		Titanium	S
Germanium	S		Tungsten	SX
Graphite	SX		Vanadium	S
Iodine	SX		Yttrium	X
Lead	S		Zinc	SX

X - Net import reliance of 50 percent or more in 1987
S - On National Defense Stockpile list (9/30/87)

Source: U.S. Bureau of Mines 1988

its Fontana steel works, starting in the mid-1950s. Just outside the study area, a talc mine was also opened during the pre-World War I years, and in 1925 a strontianite discovery in the Mud Hills southwest of the study area resulted in at least one small commercial shipment.

World War II brought exploration activities of another type. Federal Regulation L-208 stopped gold mining, but other mineral activity increased. The Mud Hills strontianite deposit reopened on a small scale with indifferent results. Tungsten was discovered north of the Olympus Mine, and small shipments resulted. Barite was found to exist in the Calico District and just south of the present Fort Irwin boundary. Bentonite was discovered near Bitter Springs, within the present military reserve. None of these developments were significant.

The U.S. borate industry is concentrated in southern California in the immediate vicinity of the study area. During the late 1800s, production of colemanite ores from the Calico Mountains south of the study area established the United States as the principal world borate supplier. With the discovery of large deposits near Boron, California, however, production in the Calico Mountains ceased.

In 1947, a pumice quarry was opened along the western edge of the Superior Valley west of the study area. This produced several thousand tons of pumicite for lightweight construction materials. Also within the western portion of the study area, the Starbright Tungsten Mine was discovered in 1950. Several years of significant scheelite production followed. During this tungsten boom, the Moonlight and Tungsten King deposits were also discovered, but never achieved production status.

During the early 1950s, two roofing-granule plants close to the study area boundary, near Barstow, commenced operations that continue today. For plant feed, various-colored rocks are quarried from nearby locations. Two alternative sources of rock supply for these operations are the Rainbow and Green Mountain placer claims. In addition, diorite-gabbro rock is also mined from deposits within the study area.

Improved gold prices in the 1970s greatly increased claim-locating activity throughout the study area and resulted in some actual gold production. Heap leaching at Goldstone and at the Sens Mining Company operation has seemingly been abandoned. Dry placer outfits are in place near and north of Williams Well, but all are apparently operated only intermittently or are dormant. Within the study area, large blocks of claims have been allowed to lapse, although others, especially on the west side, have been kept current. However, none of these locating efforts seem to have been followed by extensive, systematic exploration. Except for a few dry placer operations, only the Shining Dawn gold property was considered significant enough for possible development in the late 1980s, but no production has been reported to date.

Prospecting activity within the Silurian Valley portion of the study area began in 1848 when the gold mineralization at Salt Spring was discovered. Attempts to mine the gold began soon afterward, but were not successful due to remoteness of the area, lack of sufficient water (a regional problem hindering mining throughout the Mojave Desert), and hostile indians (Belden 1966). Mining efforts were later successful with at least $100,000 worth of gold credited to the Salt Spring area mine.

By the 1870s, Silurian Valley prospecting activity had increased due to higher prices for silver, better transportation, and the availability of mills to process the ore. Increased activity was particularly noted in the southern Avawatz Mountains and the northern Soda Mountains (Vredenburgh 1981). In the 1880s and 1890s, prospecting and development activity continued, especially in the central and northern Avawatz Mountains and the Silurian Hills, where discoveries of high grade lead-silver mineralization occurred. The Riggs Mine was discovered and developed in the 1890s with production continuing into the 1920s. The Avawatz Crown Mine was discovered in the 1890s with development and production occurring in the early 1900s. It was about this time that the salt deposits in the northern Avawatz Mountains were discovered. Some salt was mined for the reduction of silver ores (Vredenburgh 1981).

Talc, gypsum, and celestite deposits were discovered in the early 1900s. Talc deposits in the study area were not put into production until 1910 and continued until the 1970s. Production was dependent on increased industrial uses and expanding markets on the west coast (Wright 1968).

With the beginning of World War I, nitrate occurrences were investigated, and manganese and iron resources in the Owlshead Mountains were noted. Iron and manganese were produced from these deposits during World War II. During the 1950s and 1960s, iron was produced in the Southern Avawatz Mountains for consumption in southern California steel mills.

Prospecting activity has continued up to the present time throughout and adjacent to all portions of the study area. In the late 1940s, the Avawatz Crown Mine was investigated by Cyprus Mining Company. Cyprus returned in the 1960s and the late 1980s. In 1981-1982, Newmont Mining Company conducted detailed mapping and geophysics on the Avawatz Crown Mine. They also staked additional claims around the patented group. St. Joe Minerals conducted extensive exploratory drilling in the Goldstone area in the mid-1980s. U.S. Borax has conducted wide-spaced exploration drilling in its search for additional borate resources. Exploratory drilling for metallic minerals is currently underway on one claim group in the Silurian Hills and preliminary investigation has resulted in renewed exploratory interest in the eastern Silurian Hills along the boundary of the study area.

3.12.3 Current Mineral Interest and Mining Activity

The only continually active or recently reactivated mineral operations in proximity to the study area are the Brubaker-Mann and Calico Resources quarries, producers of crushed stone; the Barstow sand and gravel pit; the Desert Bark Common Use Area, a small decorative stone source operated by BLM, producing between 600 to 1,500 tons annually under 6 to 10 small contracts; and the Iron Mountain Mine. The Brubaker-Mann Quarry is producing decorative rock at the rate of 145 tons per month. Calico Resources has at least three active quarries in the study area for crushed stone; one quarry produces over 1,500 tons each year from diorite and gabbro, and a second

quarry near the study area boundary in the Superior Valley produces about 2,000 tons per year from pink granite. Iron ore is being produced from the Iron Mountain patented claim group under a lease from Kaiser Resources (claim owner) K D Mining, which is producing from existing stockpiles at a rate of 50,000 tons per year. K D Mining plans to begin open-pit mining operations and increase production to 150,000 tons per year.

Although no production figures are available, five or six intermittently active, one-man, dry placer gold operations occur within the area. Gold exploration activity in the Goldstone District, located in the western portion of the study area, declined in 1988 with the abandonment of St. Joe Minerals' exploration project. During BOM fieldwork for the Silurian Valley study (BOM 1993), it was noted that prospecting activity is continuing. Various companies have expressed interest in exploration and development of disseminated gold deposits in the Silurian Hills near the east boundary of the study area. Drilling was noted on one claim group in the Riggs District and assessment work was ongoing in other parts of this district. Claim staking was also noted in the central Avawatz Mountains, adjacent to and south of the Avawatz Crown mine.

Regarding nonmetallic minerals, known talc and gypsum deposits have attracted market interest regionally, but deposits in the study area have not seen development. U.S. Borax & Chemical Corporation and BHP Minerals hold untested and unproven blocks of claims for borate deposits within the study area, and Pfizer Minerals holds substantial resources of limestone in the Alvord Mountains.

No federal or state of California oil and gas, coal, potash, sodium, or geothermal leases are within the study area.

Table 3.12-4 lists existing properties/mines close to or within the Proposed Action area according to the BLM classification system. Figure 3.12-1 shows the locations of the mines. For purposes of classifying, either a dollar value or tonnage figure is used to determine whether "important amounts" are present. In cases where dollar or tonnage figures are unavailable, field observations or information obtained from the literature are used to classify.

On March 22, 1995, a review of active and closed mining claims within the Silurian Valley was undertaken using the BLM database for mining claims. The number of active claims within the Silurian Valley totaled 766. This number includes unpatented, as well as patented, claims. Numerical breakdown based on Township and Range is as follows:

Township	Range	No. of Unpatented Claims
15N	8E	54
15N	9E	8
16N	6E	18
16N	7E	27
16N	8E	130
16N	9E	29
17N	5E	1
17N	7E	25
17N	8E	101
17N	9E	12
18N	3E	24
18N	4E	16
18N	6E	91
18N	7E	141
18N	8E	89

Most mining claims are located east of Highway 127, with a concentration of claim activity in the Silurian Hills located on the central eastern section of the study area. Townships 17N 8E, 17N 9E, and 16N 8E encompass this Silurian Hills area.

To a lesser degree, numerous claim activity is located in the Salt Creek area of the study area. Township 18 Range 7 represents this area.

3.12.4 Mineral Resource Summaries and Models

Modeling of mineral resources provides information on the effects of the Proposed Action on potential future mining operations. Figure 3.12-2 shows the potential areas where mineral deposits may be found in the study area. Five of 15 combinations of commodity and deposit types having moderate to high mineral potential for occurrence in the study area and representing economically significant regional resources were addressed in the initial assessment of mineral potential prepared by the BOM in 1989. These five deposit-commodity types include bedded borate deposits, epithermal quartz-alunite gold veins, rare-earth oxide veins, wollastonite skarn deposits, and playa-laid zeolite beds. As part of the 1993 study of the Silurian Valley, the BOM prepared four additional resource models for deposits of talc, lead-silver, salt, and gold (open pit mining method). Summaries of the 15 commodity-deposit types follow with the five that

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Table 3.12-4

SUMMARY, CLASSIFIED MINES/PROSPECTS

Map No.	Property	Commodity	Property Type		Property Status			Location			Operation Type		Reserves	Resources
			Patented Claims	Unpatented Claims	Current Producer	Past Producer	Resource	Section(s)	Township	Range	Surface	Under-ground	(tons)	(tons)
1	Brubaker-Mann	decorative rock	1 (1-patent pending)		X			34	12N	5E	X		?	
2	Crackerjack Bonanza	gold	7			X > $50,000		12, 13	14N	6E		X		?
3	Goodwater	bentonite					X	12, 13	14N	6E	X			?
4	Iron Mountain	iron	6		X 50,000 T/yr	X 700,000 T		11, 12, 13, 14	15N	6E	X		5,175,000[4] (54% Fe)	1,000,000(e)[1] (54% Fe)
5	Iron Mountain Placer	gold	1			X		12, 13	15N	6E	X			?
6	Bat	iron	4			X 30,000 T		12	15N	6E	X		1,1000,000[1] (54% Fe)	
7	Iron king	iron	1			X		18	15N	7E	X			375,000(e)[1]
8	Morris A.C.	gold	1			X		7	16N	7E		X		inferred ?
9	Avawatz Crown (Old Chinaman)	lead, silver, gold	6			X > 20 T		1	16N	6E		X		inferred ?
10	Ceramic Mine	talc	2			X 1,000 T		4	16N	9E	X	X		5,000(e)[2]
11	Riggs Group	lead, silver	7			X >$200,000		1, 2 34, 35	16N 17N	8E 8 e		X		131,600(e)[3]
12	Silver Lake Group	talc	15			X 210,620 T		21, 22, 23, 26, 27, 28	16N	9E	X	X		116,400(e)[3]
13	Florance/ Highbinder	gold	2			X		5, 6	17N	5E		X		7,300,000(e)[3]
14	Home Placer	gold	1			X		5	17N	5E	X			?
15	Ruby Placer	gold	1			X		5	17N	5E	X			?
16	Wallace	gold				X		5	17N	5E		X		inferred ?
17	Anvil	copper		3			X	10, 15	17N	6E		X		?

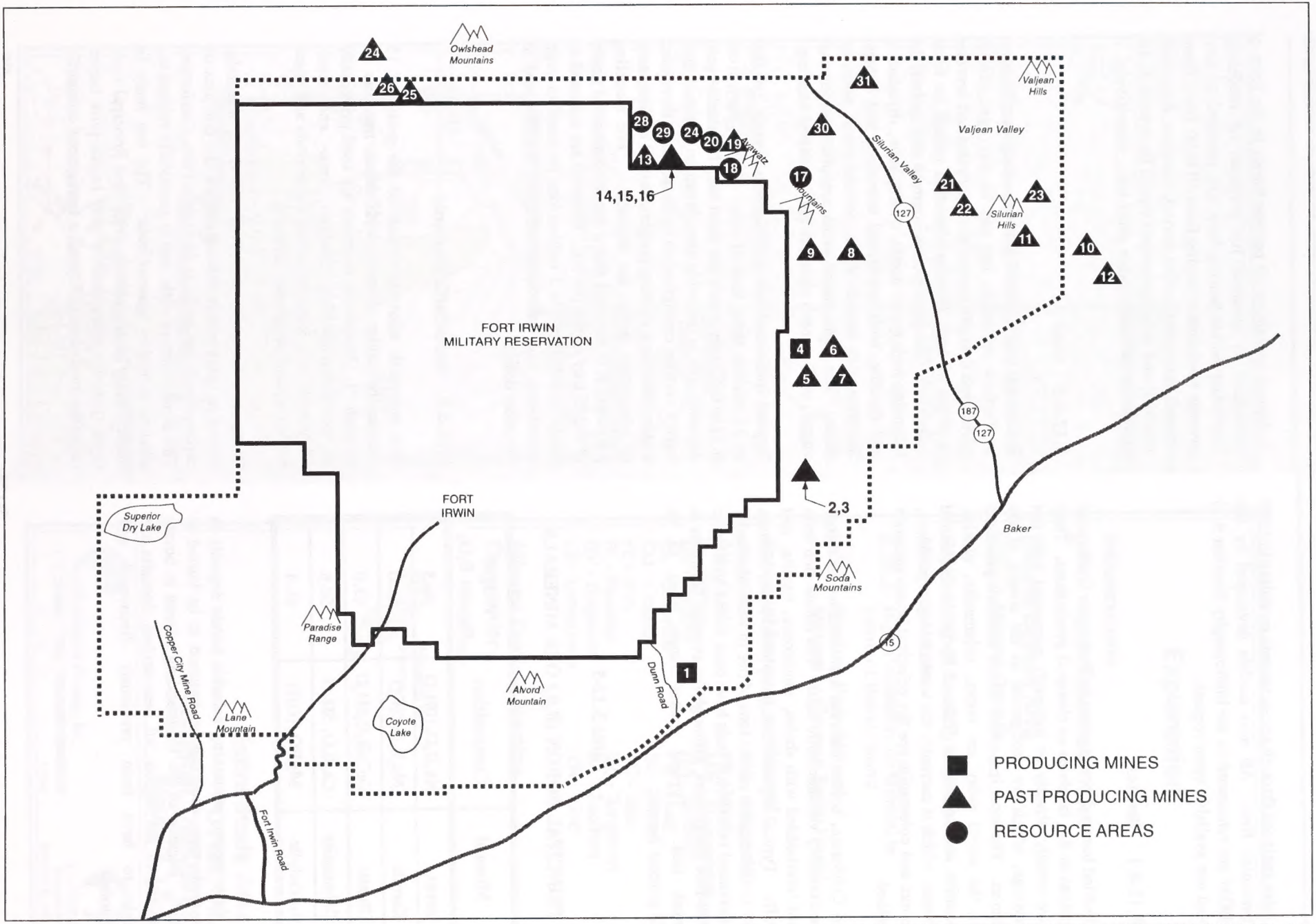
Table 3.12-4

SUMMARY, CLASSIFIED MINES/PROSPECTS

Map No.	Property	Commodity	Property Type		Property Status			Location			Operation Type		Reserves	Resources
			Patented Claims	Unpatented Claims	Current Producer	Past Producer	Resource	Section(s)	Township	Range	Surface	Under-ground	(tons)	(tons)
18	Unknown	barite		1 (?)			X		17N	6E		?		?
19	Sheep Creek	talc	3			X 20,000 T		5	17N	6E	X	X		inferred ?
20	Big Niter Group	gypsum, celestite	7				X	5, 6 1, 2, 3 34, 35	17N 17N 18N	6E 5E 5E	X	X		150,000(e)[1]
21	Berry Hill Mine	talc		3		X 3,000 T		26, 35	17N	8E	X	X		?
22	Annex (Silver Hill)	lead, silver		4		X 100 T[4]		26, 27	17N	8E	X	X		?
23	Alta	lead, silver		?		X >$10,000		24 19	17N 17N	8E 9E		X		?
24	Jumbo Group	salt, gypsum	11				X	16, 21, 22, 27, 35, 36 1 6	18N 17N 17N	5E 5E 6E	X			10,000,000(e)[3]
25	New Deal Mine	manganese	state lease			X <5,000 T		16	18N	3E	X	X		inferred 130,000[5]
26	Owl Hole Mine	manganese	state lease			X 852 T		16	18N	3E		X		inferred 79,000(e)[5]
27	Black Magic Mine	manganese	?	?		X 350 T		5, 8	18N	3E	X	X	?	
28	Celstite Hills	celestite	3				X	18, 19	18N	5E	X			100,000(e)[1]
29	Boston Valley area	salt	?	?			X	21, 22, 27, 28	18N	5E	X			25,000,000(e)[3]
30	Salt Spring	niter		?		X		30	18N	7E	X			?
31	Salt Spring claim group	gold		4		X >$100,000(e)		18, 19	18N	7E	X	X		inferred ?

Note: (e) = estimates; T = tons

[1] Vrendenburgh 1981:16 [2] Wright 1968:40 [3] This report [4] Goodwin 1957 [5] Koch and Ach, et al 1984



LOCATION OF MINES AND RESOURCE AREAS IN THE STUDY AREA
Figure 3.12-1

were analyzed through geo-economic modeling in 1989 presented first. All nine models developed by the BOM are referenced in the bibliography (Section 9.2) and are available upon request.

3.12.4.1 Borates

Bedded borate deposits occur in Tertiary or Quaternary playas or dry lakebeds as chemical precipitates. They are usually directly or indirectly associated with hot springs, which are recognized as the source of the boron. The most important borate minerals produced in the world today are borax, colemanite, ulexite, kernite, and szaibelyite (Table 3.12-5). In the United States, which is currently the world's largest producer, borax and colemanite are the principal boron minerals mined.

In California, borate reserves are contained in mixed sedimentary volcaniclastic units. The borate-rich beds are interbedded with shales, mudstones, basalts, and tuffs. Typical deposits being exploited today contain 10 to 100 million metric tons of ore in lenticular beds. Individual borate-rich beds have been found with up to 200-foot thicknesses, although the average thickness is much less. Typical grades range from 15 to 25 percent borate.

Table 3.12-5

PRINCIPAL BORON (B_2O_3) ORE MINERALS

Mineral	Composition	Weight Percent B_2O_3
Borax	$Na_2B_4O_7 10H_2O$	36.5
Kernite	$Na_2B_4O_7 4H_2O$	51.0
Ulexite	$NaCaB_5O_9 8H_2O$	43.0
Colemanite	$Ca_2B_6O_{11} 5H_2O$	50.8
Szaibelyite	$MgBO_2$ (OH)	41.4

If there are any remaining valuable borate deposits in the study area, they can be assumed to be buried at depth. Because of the longstanding interest in borate deposits in the region, all near-surface deposits are likely to have been previously discovered and exploited.

A deposit containing 20 percent borate in the form of colemanite is assumed for purposes of modeling. Individual borate-bearing beds are assumed to have average thicknesses ranging from 10 to 20 feet. Based on a 20-year production period, reserves for small, medium, and large operations would be at least 3, 15, and 30 by 10^6 recoverable short tons, respectively.

3.12.4.2 Gold

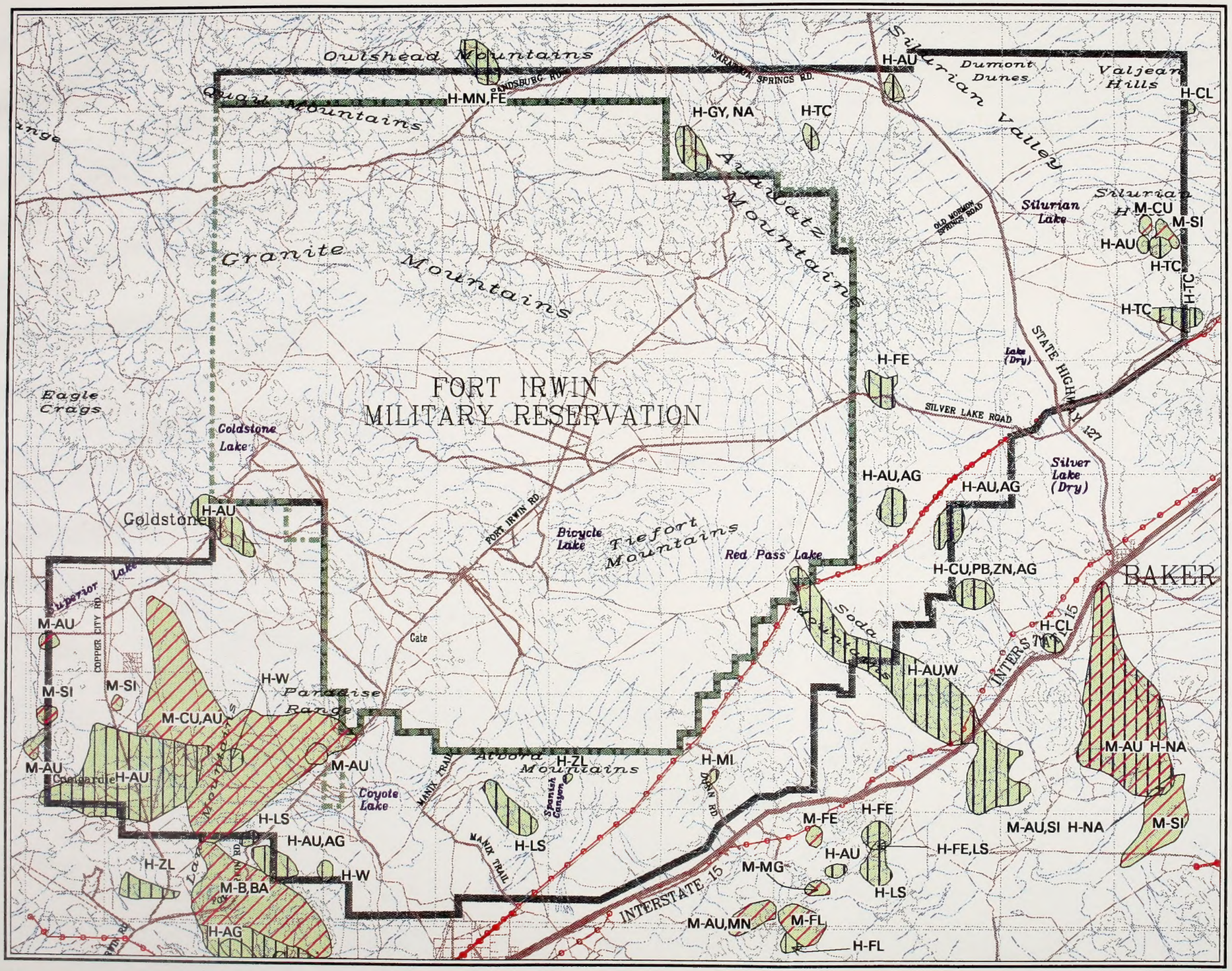
Epithermal quartz-alunite gold deposits generally occur in Tertiary volcanics, but can be any age. Gold, pyrite, and enargite appear in vuggy veins and breccias in zones of high alumina alteration related to felsic volcanism. The geologic environment may include the following rock types: dacite, quartz latite, rhyodacite, and rhyolite, with hypabyssal intrusions and domes. Structures can include veins, breccia pipes, pods, or dikes. The replacement veins are often porous and vuggy, with a comb structure and crustified banding.

Typical epithermal lode gold deposits contain 220,000 to 11 million short tons of ore. Grades vary from 0.11 to 0.52 troy ounce per short ton. If valuable gold deposits exist in the study area, it can be assumed they have a vertical configuration to the surface; therefore, a comprehensive drilling program would be necessary to adequately define the deposits. For modeling purposes, it is assumed that a deposit contains a grade of 0.245 troy ounce per ton. Reserves are assumed to range from 600,000 to 3 million tons for small to large operations, and vein widths of 8 feet are assumed in the mine design.

3.12.4.3 Rare-Earth Elements

The rare-earth minerals consist of the group of 15 chemically similar elements with atomic numbers 57 through 71. Rare-earth elements are used principally as petroleum-cracking catalysts, iron- and steel-alloying agents, glass-polishing compounds and glass additives, and permanent magnets.

Bastnasite, the main source of rare-earth minerals, occurs in veins and as disseminations in a complex of carbonate-silicate rocks at Mountain Pass, California. The deposit occurs with, and is genetically related to, alkaline intrusive igneous rock. The ore body is lithologically heterogeneous, with three principal rock types typically recognized: a gray calcite-pink barite rock (the most abundant type), a ferruginous dolomitic



November 25, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

Explanation

Infrastrucutre

Power/Transmission Lines

Mineral Deposit Area

Mineral Deposit

Probability of Finding Element or Mineral in Area

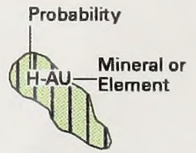
High Probability of Mineral or Element Being Found

Medium Probability of Mineral or Element Being Found

Potential Element or Mineral

AG - Silver	MG - Magnesium
AU - Gold	MI - Mica
B - Boron	MN - Manganese
BA - Barium	NA - Sodium
CL - Chloride	PB - Lead
CU - Copper	SI - Silicon
FE - Iron	TC - Talc
FL - Fluorite	W - Tungsten
GY - Gypsum	ZL - Zeolites
LS - Limestone	ZN - Zinc

Mineral Deposit Naming Convention



Entire Study Area
POTENTIAL MINERAL DEPOSITS
Figure 3.12-2

Chambers Group, Inc.

5 2.5 1.25 0 5 Miles

1" = 30000'
Project# 6347
November 25, 1996

rock, and a silicified carbonate rock. All three rock types contain ore-grade percentages of bastnasite.

At Mountain Pass, the rare-earth ore body is a north-trending tabular intrusion that dips to the west at an angle of about 40 degrees. It is approximately 2,500 feet long, with an average thickness of 200 feet, and extends to a depth of about 3,000 feet. Mineral composition of the ore is typically 40 percent calcite, 25 percent barite and/or celestite, 12 percent bastnasite, 10 percent strontianite, 8 percent silica, and minor amounts of apatite, galena, hematite, and monazite.

If economically recoverable concentrations of rare-earth minerals exist within the study area, the deposits would presumably be similar to Mountain Pass. Ore-grade material would contain approximately 5.0 percent rare-earth ore with a mineral composition similar to the Mountain Pass rare-earth ore body. Deposit size, based on a 20-year mine life, would be 3.6, 14.6, and 146 million tons for the small, medium, and large operations, respectively. Stripping ratios would be 1 ton of waste per ton of ore for each size scenario.

3.12.4.4 Wollastonite

Wollastonite deposits in the United States are directly associated with skarn produced through contact metamorphism of Paleozoic and Precambrian limestones and igneous rocks. Depending on the composition of the original limestone and igneous material, wollastonite deposits usually contain varying amounts of calcite, quartz, garnet, epidote, and diopside. Deposits being exploited today are typically in excess of 10 million tons, grading from 50 to 70 percent wollastonite. The wollastonite usually occurs in bands that may have thicknesses of more than 10 to 30 feet in higher grade material; however, the layers often include varying proportions of quartz, calcite, garnet, epidote, and diopside.

For modeling purposes, the wollastonite deposit is assumed to contain 60 percent wollastonite, 30 percent calcite, 5 percent quartz, and 5 percent weak magnetics (garnet and diopside). For the small, medium, and large operations, tonnages required would be 1, 2, and 5 million tons, respectively. The deposit would be amenable to open-pit mining and would have an associated 3:1 waste to ore stripping ratio. Because of impurities, processing would require both wet and dry circuits. Dry circuits would include size reduction, high-intensity magnetic separation, and size classification; wet processing would include selective flotation to remove calcite and quartz.

3.12.4.5 Zeolites

Zeolites result in nature from alteration of volcanic glass in tuffs and tuffaceous sediments. More than 30 varieties of zeolite minerals are found in nature, but synthetically produced zeolites currently dominate the zeolite market. However, the continuing expansion of the commercial zeolite market suggests that use of the naturally occurring materials will also increase.

Several zeolite localities are known in the immediate vicinity of and within the study area. Of greatest interest commercially is a clinoptilolite deposit located outside the study area known as the Big W deposit. For modeling purposes, it is assumed that the zeolite body is essentially monomineralic with clinoptilolite content exceeding 90 percent. It is also assumed that the body is flat lying and exposed at the ground surface with less than 33 feet overburden at any point, making it readily minable through open-pit methods. Milling of the model deposit would include crushing, screening, and product packaging.

Reserve tonnages necessary to maintain the production levels at small, medium, and large operations for a minimum of 20 years would be 0.6, 2, and 3 million tons, respectively. There are no assumed deposit thicknesses for this model.

3.12.4.6 Lead-Silver

Lead production in the U.S. continues to decrease because of market decline and the lack of smelting capacity. Silver production is also declining because of falling prices, oversupply, and market substitution (BOM 1991).

Lead is used in glass, paint, ceramics, and batteries. Silver is used in films and photographic paper, electronic products, batteries, and jewelry (BOM 1992).

Lead-silver production has occurred in the Riggs District and at the Avawatz Crown Mine. In the Riggs District, the Riggs Mine has recorded production, probably greater than 200,000 ounces. As modeled, mineralization occurs in iron-manganese stained dolomites in the upper plate of a low angle fault.

Production began in the early 1900s and continued into the 1920s. The Avawatz Crown Mine is credited with producing at least 20 tons of "high-grade" ore during the early 1900s. At this mine, mineralization occurs in brecciated quartzites in the upper plate of a low angle fault (Spencer 1980). The brecciated quartzites are within a red-stained (iron oxides after sulfides) zone striking north to northwesterly. The zone is approximately 1 to 1.5 miles long and up to 0.5 mile wide.

3.12.4.7 Iron and Manganese

Only minor manganese ore production occurs in the United States, and 98 percent of that production is in Michigan and Minnesota. Major producing countries are Australia, Brazil, Gabon, and the Republic of South Africa. Manganese is used principally in the iron and steel industry, aluminum industry, and chemical and feed supplement industries (BOM 1991). Production in California is used to make ferro-concrete products (BOM 1991). Both iron and manganese have been produced from the study area.

Manganese production has come from the Owlshead Mountains at the New Deal and the Black Magic Mines. At the New Deal Mine, manganese is part of the cementing material of a Tertiary fanglomerate unit. The cement also consists of hematite and calcite. (Trask 1950:203-205). At the Black Magic Mine, the manganese mineralization occurs as the cementing material of a limestone-igneous breccia.

Iron resources within the study area occur in the Silver Lake District, where three deposits comprise most of the reserves and account for all of the production. The three deposits are the Iron Mountain group, the Bat group, and the Iron King lode. The iron mineralizations occur in a low angle fault zone breccia composed principally of limestone, igneous, and metamorphic rock fragments. The iron mineralization is mostly magnetite, with some hematite and minor limonite (Lamey 1948:41-58).

3.12.4.8 Talc

About 98 percent of the U.S. talc production comes from Montana, New York, Texas, and Vermont, with Montana accounting for 41 percent of the total U.S. production (BOM 1992). California is listed as a producer, but production figures were not available. The average value of processed talc was $116.00 per ton in 1992.

The study area lies at the southern end of the Death Valley talc-producing trend. The largest talc-producing unit in the study area has been the Silver Lakes group, from which in excess of 200,000 tons of talc have been produced. Talc reserves in excess of 100,000 tons remain, and the potential for additional undiscovered resources is considered high. There are two talc-producing mines of record in the Riggs District. The Berry Hill Mine has had 3,000 tons of talc production and has moderate potential for additional resources; the Ceramic Mine has produced 1,000 tons of talc and has an estimated 5,000 tons of reserves (Wright 1968).

3.12.4.9 Salt, Gypsum, and Celestite

California is number six in U.S. salt production. Salt is used for ice control and primary water treatment, and by the chemical, food, and agriculture industries, as well as other industrial uses (BOM 1991). California is also one of the top states producing gypsum, which is used in the manufacture of wall board and cement, and in agriculture.

Salt needs for the West Coast market are currently being met through by solar evaporative production in the San Francisco Bay area and northern Mexico. Current prices of salt range from $5.00 to $6.00 per ton.

Salt resources in the study area are the massive bedded type that require open pit mining. As modeled, capital and operating costs for mining the resource would require a price range of $7.00 to $9.00 per ton to be economically feasible.

The Jumbo group, estimated to contain a salt resource of 10,000,000 tons of salt having 85 percent purity, is also considered to have high potential for a gypsum resource (Vredenburgh 1981). Detailed investigation of the Boston Valley salt deposit (Ver Planck 1957), indicated that 25,000,000 tons of salt having 88.4 percent purity occur in that area. The salt occurs in chocolate-brown Tertiary lakebed mudstones and marls, which are overlain by gray to tan gypsum- and celestite-bearing silts, mudstones, and marls.

The Big Niter group of patented claims overlies other exposures of the gray to tan lakebed sediments.

Because of the exposed strike length of the sediments and the presence of gypsum, the potential for a gypsum resource is high.

Celestite, usually observed as a whitish mineral, is a sulfate of strontium and a principal strontium ore. However, strontium has not been produced in the United States since World War I, at which time Texas and California were producers. Most of the strontium currently consumed by the United States is imported from Mexico and Germany. Strontium is used primarily by the ceramics and glass industries, but some is used in the manufacture of fireworks (BOM 1991).

There are three patented claims in the Celestite Hills. The claims overlie the gray to tan lake bed sequence and contain good exposures of bedded and nodular celestite. An estimated resource of 100,000 tons of celestite is thought to exist in this area.

3.12.4.10 Other Nonmetallic Resources

Other nonmetallic resources that occur within the study area include limestone, quartzite, sand and gravel, and geothermal uses.

Limestone of possible suitable grade for cement production has been identified south of Sheep Creek Spring and west of Silver Lake (Vredenburgh 1981). As with many nonmetalics, limestone production would be dependent on market location (distance of transportation). At the present time, it is thought that these occurrences are too remote for economic production.

Quartzite of suitable purity has been identified west of Silver Lake (Vredenburgh 1981). Quartzite is used in Portland Cement and in the manufacture of silica brick. Again, remoteness probably precludes economic development of this resource.

Sand and gravel resources have been identified in the fans along base of the Avawatz Mountains (Vredenburgh 1981), but are considered too remote for bulk marketing.

Sheep Creek Spring has been tested for possible geothermal use. The temperature recorded was 23°C, which is considered too low for development. Also, the remoteness of the occurrence would hinder any utilization.

3.12.5 Mining Socioeconomics

Mineral assessments of the Fort Irwin Margin Area and the Silurian Valley Area were conducted at different times and at somewhat different levels of detail. In addition, since the Proposed Action does not include most of the Fort Irwin Margin Area, socioeconomics of these two areas will be discussed separately.

3.12.5.1 Fort Irwin Margin Area

To initiate the assessment of the mineral potential of the study area, mine/mill models were developed for five of the potentially important deposit types that may occur within the southern and southeasterly portions of the study area (borates, gold, rare-earths, wollastonite, and zeolites). Based on available information, three levels of production from the five models were considered in the 1989 BOM assessment: high- and low-tonnage thresholds, which define the likely range of production levels, and an intermediate level. Further work, including detailed field examination of the area to better define the models, would be necessary to more accurately analyze production potential.

Assumptions pertaining to deposit sizes, ore grades, and associated gangue minerals were based on data available on typical domestic deposits currently in production. Similarly, assumptions concerning mining and processing methods that were used represent state-of-the-art, in-place technologies.

Table 3.12-6 lists mining and milling technologies by deposit type. Two alternative technologies are shown for borate because of the inherent uncertainty associated with the mineralogical characteristics of the ore. If readily soluble borate minerals are present, the less expensive solution mining option would likely be used. If the mineral is not readily soluble, the underground room and pillar method would be considered.

The range of revenues for each model is based on current commodity prices (Table 3.12-7). State and local taxes have also been estimated for the three tonnage alternatives and are summarized in Table 3.12-8. These values presume simultaneous development of all five mines.

Table 3.12-6

MINERAL RESOURCE MODELS CAPITAL AND OPERATING COSTS, FORT IRWIN MARGIN AREA

Deposit Type	Mine Size (tons ore per day)	Capital Cost (U.S. $ x 1,000)	Operating Cost (U.S. $ per day)
Borax			
Solution Mining	100	$ 13,013	$ 11,604
(ton product per day)	500	42,392	40,555
	1,000	76,486	74,500
Room and Pillar	400	22,379	12,650
	2,000	54,934	41,275
	4,000	95,268	76,130
Gold	110	5,380	9,461
	330	10,717	22,824
	550	15,519	35,120
Rare-Earth Oxides	500	9,583	16,295
	2,000	23,196	37,260
	20,000	133,837	204,200
Wollastonite	220	7,026	8,010
	440	8,985	12,638
	1,100	17,056	26,462
Zeolites	110	2,529	2,313
	330	4,152	3,398
	660	7,041	5,483

Based on the deposit model assumptions, the range of revenues for each model was calculated. These valuations use current commodity prices for the five metals and minerals contained in these deposits. The results are presented in Table 3.12-7.

Table 3.12-7

POTENTIAL MINERAL REVENUES FOR SELECTED MINERAL DEPOSIT TYPES (10^6)

Deposit Type	Production Level		
	Small	Medium	Large
Borate	$148	$ 742	$ 1,484
Gold	106	352	528
Rare-Earth Oxides	204	818	8,176
Wollastonite	54	107	268
Zeolite	50	200	300
Total	**$562**	**$2,219**	**$10,756**

Table 3.12-8

ANNUAL STATE AND LOCAL TAX REVENUES FROM MINERAL DEVELOPMENT

Small tonnage	$ 909,000
Medium tonnage	3,615,000
Large tonnage	10,677,000

Table 3.12-9

DIRECT AND INDIRECT EMPLOYMENT FROM MINERAL PRODUCTION

	Small	Medium	Large
Direct	354	760	1,611
Indirect	442	950	2,013
Total	**796**	**1,710**	**3,624**

It is estimated that each job created by simultaneous development of the five mines will result in 1.25 jobs indirectly (Table 3.12-9).

The study area includes most of the geologic terrains believed to have high or moderate potential for several Category I and II commodities. Precambrian terrain does not appear to be present in the southern portion of the study area; however, this terrain borders the southern study area and may underlie the southeastern portion. Much of the study area hosts terrains classified as "high potential" for all selected commodities except rare-earth elements. However, Paleozoic terrains, which have low potential for rare-earth minerals, and Precambrian terrains (medium potential for rare-earth elements) may probably underlie parts of the southern study area at modest depths. The "world-class" rare-earth minerals deposit at Mountain Pass is being mined east of the study area.

3.12.5.2 Silurian Valley Area

This section describes a regional economic analysis that assesses the potential economic benefits of development of selected mineral resources within the Silurian Valley Alternative.

Methodology

For the BOM 1993 regional analysis, resources were defined and mine and mill models were constructed for each resource site where development might be feasible. For operating properties, current mining and processing systems were used. Where site-specific data were unavailable or proprietary, systems in use at producing mines of comparable commodity, size, and grade were used to estimate engineering parameters. Development of mine and mill models was based on deposit geometry, tonnage, and grade. The models address such parameters as mine life, preproduction scheduling, mining method, recovery, dilution, processing method, concentrate grades, transportation costs, and smelter charges. Models assume that deposits are fully explored, and include estimated or actual costs for environmental processing and permitting, bonds, and applicable state sales tax. All costs are calculated in 1992 dollars and, other than company-supplied data, costs were derived from Schumacher (1985), Equipment Guide Book Company (1986), Richardson Engineering Services, Inc. (1984), and Means Company, Inc. (1989).

An economic analysis that simulates development and production at the resource site was applied for each completed deposit model. To standardize output, the economic analysis was used to determine commodity price requirements necessary to generate a 15-percent discounted cash flow, rate of return. These commodity prices were then used to estimate mine revenues and state and federal taxes. For all resource areas, constant costs and prices are assumed over the life of the operation to a 20-year maximum mine life. The final step was to estimate regional economic and employment impacts that could result from mineral development. The BOM IMPLAN microcomputer program was used to perform a regional input-output analysis.

Within the IMPLAN analytical program, regions are defined as the counties where mines would be located along with servicing major supply points and trade centers. IMPLAN allows the analyst to remove or introduce new mines into the regional economy and determine the regional economic benefits associated with these industry changes. Regional economic benefits associated with mineral operations include industry output, personal earnings (wages and benefits), employment, and taxes paid by mining companies. These benefits are generated directly and indirectly. Direct effects occur within those industry sectors (in this case a mining sector or sectors) experiencing an initial change or continued demand for their output. Indirect effects are those changes in output, earnings, and employment that occur in regional supporting industries. Additional indirect effects result from mine and support industry employees spending a portion of their incomes on household goods, thus generating what are referred to as induced effects. The total regional impacts of mineral operations, then, are a combination of the direct, indirect, and induced effects.

Resource Models

Table 3.12-10 lists the results of the resource, mine-mill, and economic modeling. The results indicate that, at the current price of talc and the estimated amount of resource, production of the Silver Lake Mine talc deposit is not economic at this time. Similarly, production of the Boston Valley salt and the Riggs Mine metallic resources is not considered economically feasible. The Denning Spring precious metal resource, on the other hand (gneiss-hosted gold,

Table 3.12-10

ECONOMIC ANALYSIS RESOURCE MODELS

	Silver Lake Talc Resource Sections 21, 22, 23, 26, 27, 28	Boston Valley Salt Resource Sections 21, 22, 27, 28, T16N, R5E	Riggs Mine Resource Sections 1, 2, T16N, R8E, Sections 34, 35, T17N, R8E	Denning Spring Gold Sections 5, 6, T17N, R5E
Commodity	Talc	Salt	Silver, lead	Gold
Resource size, tons	130,000	25,000,000	131,600	7,300,000
Resource grade	75%	88.4%	13.5 ounces per ton silver, 5.3% per ton lead	0.1 ounce gold per ton
Operation type	underground, cut and fill	open pit	underground, cut and fill	open pit, heap leach recovery
Production rate, tons per year	26,000	500,000	26,000	360,000
Construction, number of years	1	1	1	1
Construction, number of jobs	15	18	30	30
Construction, compensation per year	$503,000	$585,000	$942,000	$1,100,000
Operating, number of years	5	20	5	20
Operating, number of jobs	40	42	32	40
Operating, compensation per year	$1,225,000	$1,447,000	$1,108,000	$1,436,000
Development costs	$616,500	$107,300	$1,281,900[1]	$1,087,500[1]
Capital cost, mine	$1,258,800	$3,915,950	$2,067,600	$3,545,500
Capital cost, mill	$810,000	$1,603,470	$966,800	$908,500
Infrastructure	$97,600	$387,000	$150,900	$224,300
Working capital	$422,200	$596,000	$410,600	$801,800
Miscellaneous	$156,200	$510,870	$241,500	$358,900
Operating cost per ton, mine	$44.17	$3.10	$54.96	$6.93
Operating cost per ton, mill	$20.79	$1.67	$17.45	$3.24
Property taxes, per year	$75,000	$88,000	$114,000	$92,000
State taxes, per year	$7,300	$48,000	$13,000	$39,000
Federal taxes, per year	$40,000	$193,000	$75,000	$204,000
Commodity price needed for 15% ROR	$141.90	$7.55 per ton	$137.77 per ton, total metal value	$187.00 per ounce gold
Present commodity price	$116.00 (1992 average price)	$4.00 - $5.00 per ton (1992 price)	$4.02 per ounce silver (9-22-93 prices) $0.35 per pound lead (9-22-93 prices)	$348.00 per ounce gold (9-22-93 prices)

[1] **Exploration costs included in total development costs.**

along a low angle fault), appears to meet the economic criteria that would suggest further testing.

Mining and the Regional Economy

For purposes of this evaluation, the "region" is defined as San Bernardino County, California. The four resource sites under consideration for this analysis are located in the Silurian Valley Alternative in central San Bernardino County. However, the nearest major rail and motor travel corridors lead to trading centers within Orange, Riverside, and Los Angeles Counties. This broader area supports mineral development activities by providing for resource acquisition, labor and supplies, product distribution, and outlets for spending personal income. One analysis was undertaken that included all four counties, while another examined impacts on San Bernardino County alone. No significant differences were observed when the four-county model was compared with just the model for San Bernardino County. Therefore, only the impacts for San Bernardino County are reported.

The San Bernardino County mining industry employs relatively few people but is an important employment sector for the geographically large rural part of the county (see Table 3.12-11). Major employment sectors in San Bernardino County vary considerably in terms of prevailing wages and employment distribution. The mining industry offers the highest per capita earnings of all employment sectors in the county, approximately $10,000 higher than the overall average for all sectors.

Table 3.12-11

EMPLOYMENT IN SAN BERNARDINO COUNTY

Sector	Jobs in 1990	Earnings ($MM)
Farm	5,217	51.7
Ag Services	5,303	65.6
Mining	934	32.5
Construction	51,125	1,245.1
Manufacturing	54,889	1,714.3
Transportation	26,499	913.6
Wholesale	21,580	680.8
Retail	98,060	1,498.9
F.I.R.E.	30,561	593.9
Services	135,258	2,612.9
Government	103,774	3,596.5
Total	**533,200**	**13,005.8**

Source: IMPLAN software datafile, 1993.

Economic Impacts

Four resource subareas within the Silurian Valley portion of the study area (Denning Springs, Silver Lakes, Riggs District, and Boston Valley) were included in the engineering and socioeconomic analysis. Table 3.12-12 shows commodity, resource, and other pertinent data for those four resource sites.

Metallic Mines

Table 3.12-13 shows the potential annual direct and indirect figures for development and operation of the Denning Springs and Riggs District resource sites, the two areas with metallic resources. Based on the assumption that these two resource sites undergo all necessary development in 1 year and are operated for projected production periods of 20 and 5 years, respectively, annual contributions from mine development and operations can be estimated.

The value of total output from the mining industry during the development phase for the two metallic resource subareas is estimated to be $11 million. Estimated total output value from local supporting industries during the 1-year development period is $5.09 million. The annual value of output from the two mines during operations is estimated at $4.85 million, with cumulative output of $72.4 million over the operating periods. Outputs from local supporting industries during the operating periods are valued at $4.68 million annually and total $66.15 million over the total operating term.

In addition to 60 mining jobs generated during the development period, approximately 79 jobs would be generated in supporting regional industries. During the operating periods, 72 jobs would be generated annually at the mines, and 69 jobs would be generated annually due to increased activity in the supporting local industries.

Earnings resulting from mine and nonmine jobs within the region were estimated from IMPLAN (name of economics software program) and estimates of average mine wages and salaries. Jobs at the potential mine sites during the development period were projected to result in $2.04 million in earnings. Jobs in supporting local industries during the development period would

Table 3.12-12

DEPOSITS INCLUDED IN ECONOMIC ANALYSIS

Name	Years	Commodity	Size (000) Ton[1]	Operation Type	Surface Disturbance
Denning Springs	20	gold	7,300	Open pit	100 acres
Riggs District	5	silver, lead	131	Underground	20 acres
Silver Lakes	5	talc	130	Underground	10 acres
Boston Valley	20	salt	25,000	Surface	100 acres

[1] Stated resources support the assumed production period.

Table 3.12-13

ANNUAL IMPACTS OF DEVELOPMENT AND OPERATION AT METALLIC RESOURCE SITES, SAN BERNARDINO COUNTY

Value	Development		Operation	
	Direct[1]	Indirect[2]	Direct[1]	Indirect[2]
Total output ($MM)	11.00	5.09	4.85	4.68
Employment (jobs)	60	79	72	69
Earnings ($MM)	2.04	1.77	2.54	1.50

[1] Direct includes only those output, employment, and generated at the mine sites.
[2] Indirect are those output, employment, and earnings generated at supporting industries through mine and household spending.

likely provide $1.77 million in earnings. During operation of the two projects, mine employees were forecast to earn $2.54 million annually, or a total $34.35 million during the two operating periods. At the same time, supporting industry employee earnings were projected at $1.50 million annually, or $20.93 million over the operating lives of the two metallic mines.

Nonmetallic Mines

Table 3.12-14 shows the potential joint annual direct and indirect figures for development and operation of the Silver Lakes and Boston Valley deposits (the deposits with nonmetallic resources).

Projected operating periods are 5 years for Silver Lakes and 20 years for Boston Valley. Based on the assumption that these two resource sites undergo all necessary development in 1 year and are operated for their projected respective production periods of 5 and 20 years, annual contributions from development and operation of the mines can be estimated in the same manner as for the metallic sites.

The estimated value of total output value from the two nonmetallic mines during the development phase is $8.98 million. Total output from supporting local industries during the 1-year development period is estimated to be $3.57 million. The annual value of output from the mines during operations is estimated at $4.07 million with cumulative output of $56.05 million over the two operating periods. Estimated value of output from supporting local industries during

Table 3.12-14

ANNUAL IMPACTS OF DEVELOPMENT AND OPERATION AT NONMETALLIC RESOURCE SITES, SAN BERNARDINO COUNTY

Value	Development		Operation	
	Direct[1]	Indirect[2]	Direct[1]	Indirect[2]
Total output ($MM)	8.98	3.57	4.07	4.02
Employment	33	56	82	63
Earnings ($MM)	1.09	1.29	2.68	1.30

[1] **Direct impacts include only those output, employment, and earnings generated at the mine sites.**
[2] **Indirect impacts are those output, employment, and earnings generated at supporting industries through mine and household spending.**

mine operations is $4.02 million annually and $53.80 million over the operating terms.

Although only 33 mining jobs would be generated during the period of development, an estimated 56 jobs would be generated in regional supporting industries. During mine operations, 82 jobs would be provided at the mines on an annual basis, and 63 jobs would be associated with the increased annual activity in supporting local industries.

Earnings resulting from the nonmetallic mine and nonmine jobs within the region are estimated from IMPLAN and estimates of average mine wages and salaries. Forecasted jobs at the potential mine sites during the development period result in $1.09 million in earnings. Jobs in other local industries during the development period provide $1.29 million in earnings. Estimated earnings from mine jobs during the operation phases of these projects are $2.68 million annually, or $35.15 million over the operating life of the projects. Earnings from nonmine jobs in the region during the respective periods of mine operations are estimated at $1.30 million annually, or $17.57 million over the operating lives of the mines.

Table 3.12-15 summarizes total annual output, employment, and earnings figures within San Bernardino County that would be generated individually by development of the four resource subareas. Totals include the direct and indirect revenues generated as a result of the potential mining activity.

Table 3.12-15

REGIONAL OPERATIONS FOR METALLIC AND NONMETALLIC RESOURCES, SAN BERNARDINO COUNTY

Property Name	Phase	Years	Total Output ($MM)	Total Jobs	Total Earnings ($MM)
Denning Springs	Development	1	9.30	75	2.11
	Operation	20	6.06	81	2.34
Riggs District	Development	1	6.79	64	1.71
	Operation	5	3.47	60	1.70
Silver Lakes	Development	1	4.13	35	0.95
	Operation	5	3.45	68	1.79
Boston Valley	Development	1	8.42	54	1.42
	Operation	20	4.64	78	2.18

3.13 UTILITY CORRIDORS

Public lands managed by BLM often provide suitable locations for utility transmission lines. The Desert Plan, as amended, provides specific corridors for location of major transmission lines that were developed to concentrate the impacts of utility lines in manageable locations. Three of these corridors occur within the project study area. These corridors contain powerlines essential for transmitting power to the Los Angeles area, transcontinental fiber-optic communication cables, and trans-state oil and gas pipelines. Future uses are planned for the corridors that are now from zero to 20 percent occupied. These corridors are able to provide utility companies with certain access across the California desert to meet present and future needs.

The BLM, through the California Desert Plan, currently maintains two joint-use utility corridors within the study area (Figure 3.13-1): Utility Corridor "D" (Boulder Corridor) and Corridor Q. In addition, the Corridor BB joint-use corridor is outside and adjacent to the study area, to the southeast. The three corridors merge near the southeastern boundary of the study area; from there, Corridor BB continues to the southwest, Boulder Corridor is aligned northeast and south, and Corridor Q moves due west from its starting point at the corridor junction. Joint-use utility corridors are defined as tools for guiding different types of utility facilities within a planned utility corridor right-of-way. These joint-use corridors may consist of electrical transmission towers and cables of 161 kilovolts (kV) or above; natural gas, water, or petroleum pipelines with diameters greater than 12 inches; coaxial cables for interstate communications; or major aqueducts or canals for interbasin water transfer.

These joint-use planning corridors vary in width from 2 to 5 miles. There is an acceptable 2-mile standard for separation of existing facilities. A 2-mile width generally provides sufficient flexibility in selecting alternative routes for a right-of-way and provides sufficient space for evaluating a number of possible alternative routes. The 5-mile standard is used where there are no existing facilities or in those cases where there are so many facilities or merging corridors that a 5-mile width is needed to ensure sufficient space for system integrity and flexibility.

3.13.1 Utility Corridor "D" (Boulder Corridor)

3.13.1.1 Existing Uses

The primary utility corridor near the Proposed Action area is the Utility Corridor "D" (Boulder Corridor), which runs along the southern portion of the project boundary north of Baker. Boulder Corridor is 2 miles wide (Figure 3.13-1). It currently contains four overhead, high-voltage transmission lines that transport a major portion of the electrical power consumed in the southern California area. One 287- and two 500-kV alternating current (ac) powerlines exist. These three original Boulder transmission lines were constructed under congressional authority of the Boulder Canyon Act. Together, these three lines provide up to 2,400 megawatts (MW) to the Los Angeles Department of Water and Power (LADWP) system, which services the Los Angeles Basin. In addition, the Boulder Corridor contains the Intermountain Power Agency (IPA) 500-kV direct current (dc) transmission line, which provides up to 1,900 MW (McCarthy, LADWP, personal communication, 1988). Approximately 6 miles of the IPA right-of-way in the study area are owned in fee by the IPA. These overhead transmission lines currently run within rights-of-way adjacent to the serrated, southeastern edge of the existing Fort Irwin boundary (Figure 3.13-1). Because the towers are outside of the current NTC boundaries and therefore not affected by maneuvering aircraft, they are not illuminated for identification at night.

Other types of facilities included within the Boulder Corridor consist of Williams Telecommunications' single underground fiber-optic telecommunications cable and associated aboveground support stations (Figure 3.13-1) located at intervals of 20 to 25 miles. This 10-foot right-of-way provides an easement for the backbone of its interstate digital fiber-optic system from Los Angeles to the East Coast. The Kern River Gas Transmission Pipeline was installed in early 1992. This buried natural gas pipeline follows the Boulder Corridor and has two aboveground block valve locations.

3.13.1.2 Future Uses

The Boulder Corridor has been identified by the Secretary of the Interior as one of 16 utility corridors planned for development in the California desert

between the years 1980 and 2000 (BLM 1980). The Federal Energy Regulatory Commission (FERC) and California SLC have both received applications from utility companies for a utility right-of-way permit for proposed natural gas pipelines to transport supplies from various sources outside California to destinations in central California for use in oil recovery and related cogeneration projects.

3.13.2 Utility Corridor "BB" (Interstate 15 Corridor)

3.13.2.1 Existing Uses

Utility Corridor BB (Interstate 15 Corridor) is an existing 2-mile-wide utility corridor running north-south roughly parallel to I-15 outside and southeast of the study area (Figure 3.13-1). The transmission line has a nominal capacity of 2,000 MW from the International Power Plant near Delta, Utah, to the Adelanto Substation in California. In addition, the I-15 Utility Corridor houses two fiber-optic telecommunications facilities (AT&T and U.S. Sprint) installed and buried to a depth of approximately 42 to 50 inches. The fiber-optic facilities include two repeater/support stations located at the Baker and Dunn Road overcrossing.

Contel Telecommunications currently operates within and along the I-15 Utility Corridor. Contel maintains buried copper cables in the Manix area, buried fiber-optic cable in the Paradise Valley area, and microwave sites at Lane Mountain, Superior Valley, Government Peak, and Ford Mountain.

Southern California Edison (SCE) facilities are generally located within the I-15 Utility Corridor. Existing powerlines include one 138-kV transmission line identified as the Hoover-Mountain Pass Transmission Line. This overhead transmission line is the major provider of electricity to residences located within the study area. AT&T, a fiber-optic telecommunication carrier, received a right-of-way grant and the line has been constructed (BLM 1989b).

Other types of facilities maintained by SCE outside of the I-15 Utility Corridor include one 115-kV transmission line beginning at the Coolwater Generating Station (east of Daggett) terminating to the north at the Tiefort Substation within the existing Fort Irwin Military Reservation.

3.13.2.2 Future Uses

The I-15 Utility Corridor has been identified by the Secretary of the Interior as one of 16 utility corridors planned for development in the California desert between the years 1980 and 2000 (BLM 1980). IPA currently holds a grant to construct a 500-kv (dc) transmission line in the I-15 utility corridor. This could occur if additional generating units were constructed at the IPA site in Utah.

3.13.3 Utility Corridor "Q"

3.13.3.1 Existing Uses

Utility Corridor "Q" was recently activated to full utility corridor status within the CDCA. Located southwest of the NTC (Figure 3.13-1), the corridor begins at Kramer Junction and extends east intercepting the I-15 and Boulder Corridors (near Harvard). Unlike the Boulder and I-15 Corridors, Utility Corridor "Q" is 3 miles wide. Utility Corridor "Q" houses the 500-kV Mead/McCullough-Victorville/Adelanto transmission line and the Kern. A 220-kV line from the Harper Lake Solar Project uses Utility Corridor Q to Kramer Junction, then travels the 395 Corridor to Victorville.

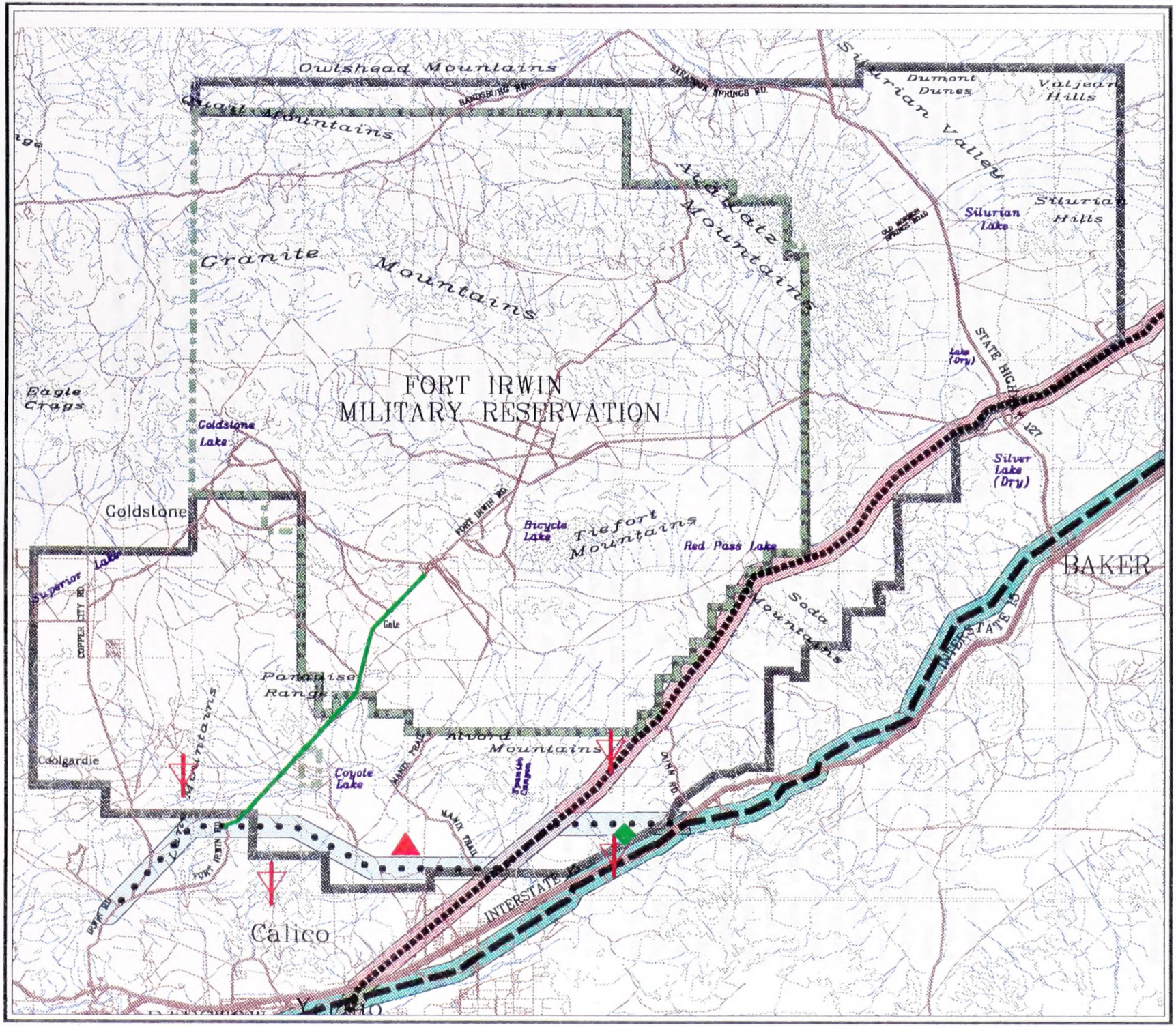
3.13.3.2 Future Uses

A 220-kV line from Coso Geothermal Developments to Victorville is currently undergoing environmental evaluation prior to permitting.

3.13.4 Other Regional Utility Corridors

3.13.4.1 Existing Uses

Eighteen joint-use utility corridors are within the CDCA. The primary goal of these corridors is to establish a network of joint-use planning corridors capable of meeting projected utility service needs to the year 2000 (BLM 1980b). Existing Corridors E, F, G, and H, as identified by the BLM, are located southeast of the Fort Irwin Military Reservation. With the exception of Corridor F, all of the corridors contain various types of utility lines. Additionally, seven contingent corridors have been identified within the CDCA as having some potential for use in the future should the project status associated with the



Explanation

- Corridor D
- Corridor Q
- Corridor BB
- Aboveground Telecommunication Lines
- Coyote Lake Gound Electrode
- Microwave Station
- Support Structure (Aboveground)

Entire Study Area
UTILITY CORRIDORS AND SUPPORT STRUCTURES

Figure 3.13-1

Chambers Group, Inc.
Project# 6347
MAP SCALE 1" = 40000'
5 2.5 1.25 0 5 Miles

November 15, 1996 - /gis1/plots/6347_ftirwin/plots/plot_8x11.aml

existing joint-use corridors change (BLM 1980). However, it should be noted that none of these mentioned corridors (E, F, G, and H) occupy routes suitable for transmission of utilities provided by the Boulder and I-15 Corridors without significant relocation costs and approvals.

3.13.4.2 Future Uses

Additional Utility Corridors E, F, G, and H, located outside of the study area, were recommended based on estimated future demand for energy requirements. Approximately 5,000 MW of southern California's electrical energy crosses the desert; this is enough to serve approximately 6 million residential customers. An estimate provided by the Joint Utility Advisory Committee indicates that, by the year 2000, a total of 20,000 MW could be transferred in bulk from within or across the California desert, enough to serve approximately 13 million residential customers. This is a significant portion of total future energy demand for southern California. Factors such as restrictions on coastal construction and air quality issues in the Los Angeles Basin area account for this anticipated increase.

3.13.5 Lane Mountain Microwave Station

The LADWP also owns a land parcel (site) on Lane Mountain (Figure 3.13-1) where a microwave station is located; this is an integral part of the control and operation of the IPA and Boulder transmission lines. This site also provides critical telecommunication data links with utilities and agencies throughout the western United States. A microwave link is sited at the IPA ground electrode site at Coyote Lake. The ground electrode is the ground line for the dc transmission line and consists of a circular array of ground connections served by overhead and underground lines connected to the IPA transmission system (LADWP 1988).

3.13.6 Local Communications/Utility Facilities

Communication sites are also present on public lands within the study area (Figure 3.13-1). These sites, providing space and elevation for microwave towers, are on strategic mountaintops enabling far-reaching microwave communications. Four sites are present at various locations within or near the study area, and the mountainous character of the region lends itself to placement of additional sites if needed.

All existing public and private utility lines are identified and discussed in the utility corridor sections. Where a utility line deviates from within one of the corridors, a discussion of its location is included below.

3.13.7 Military Communications Facilities

3.13.7.1 MILES

The MILES (multiple integrated laser engagement system) first generation system in use today uses a low-power (918 megahertz) Gallium arsenide laser transmitter to simulate the effects of live ammunition found in combat engagement situations. These low-power transmitters are fixed on all hand-carried and vehicle-mounted direct fire weapons. Receptors located on OPFOR soldiers and vehicles receive the coded laser ammunition. When a laser receptor registers a hit, it causes a signal to be broadcast via microwave ("A" Towers) located on Tiefort Mountain and Granite Mountain (Figure 3.13-1) to a central processing and display facility located on-post. The MILES first generation system, which is currently in use, has the capability of monitoring 380 to 400 vehicles at any one time. An upgrade in the current MILES system (second generation) was installed in December 1994. This second-generation MILES is able to monitor all vehicles in the NTC boundaries at any one time, creating a significant improvement in monitoring capabilities.

3.14 TRANSPORTATION AND ACCESS

The following discussion summarizes the public and military transportation system and access in the study area. Figure 3.14-1 includes a graphic representation of the general transportation system in the Fort Irwin NTC area.

3.14.1 National and State Road System

Regional access to the military reservation is provided by a few national and state highways. The major route adjacent to the study area is I-15, a national highway that links San Bernardino, California, and Las Vegas, Nevada. I-15 is a four-lane highway that provides two lanes of divided travel in each direction.

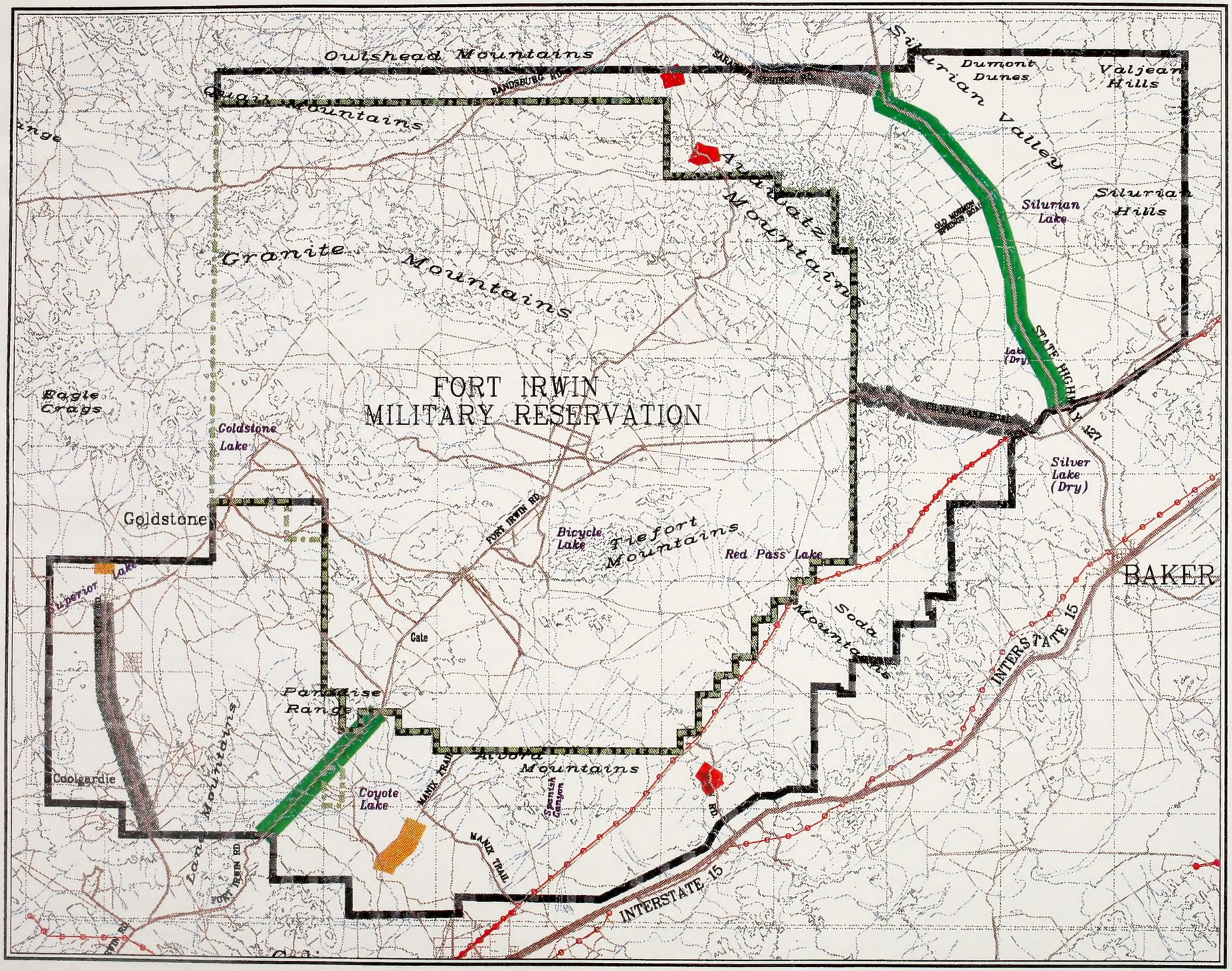
A second major route in the vicinity of the study area is I-40, a national highway that extends east-west, south of the study area. I-40 begins in Barstow at I-15 and extends east to Needles. I-40 is a four-lane highway providing two lanes in each direction.

Other regional transportation facilities in the vicinity include State Highways 14, 58, 127, 178, and 395. State Highway 14 begins near Sylmar at I-5 and extends northeast to Highway 395 in Kern County. State Highway 58 begins in Barstow at I-15 and extends west to Kern County. State Highway 58 is four lanes for a major portion of the way from Barstow west to the Tehachapi Mountains. State Highway 127, a north-south route east of Fort Irwin, begins in Baker at I-15 and extends north to Death Valley. This highway is a two-lane facility providing one lane in each direction. State Highway 395, a north-south route located approximately 40 miles west of Fort Irwin, begins in Victorville at I-15 and extends north past Fort Irwin into Kern County. This is a two-lane highway, providing one lane in each direction. State Highway 178 connects with the Sierra Nevada mountains to the west and Trona to the east.

3.14.2 Secondary Road System

In addition to the regional transportation network, a few arterials provide local service in the study area. Roads and washes over public lands provide easy access to remote locations, public and private. Access is used by residents, miners, researchers, and recreationists to enter and use public and private lands within and to the west of the study area and is generally unrestricted. Fort Irwin Road, a two-lane north-south access (one lane in each direction), provides both public and military access to Fort Irwin from I-15 in Barstow. In addition, Fort Irwin Road provides access for the NASA Deep Space Network located at the Goldstone Complex. A tank trail that extends from the Manix railhead northwest through the study area to Fort Irwin Road south of the existing NTC provides a means of transporting equipment and vehicles to Fort Irwin. Many of these roads provide access to residences, mining claims, and recreation areas within and adjacent to the study area. Copper City Mine Road provides a link to other dirt roads that provide access to Black Canyon and Inscription Canyon. The Utility Corridor "D," an unimproved dirt road, extends southwest to northeast, linking I-40 south of Fort Irwin and State Highway 127 to the east. This road is maintained by LADWP for transmission line access. An unimproved dirt road also runs along sections of the Utility Corridor "Q" for transmission line access.

Other local circulation needs within the study area are accommodated by a few light-duty, unpaved roads. Silver Lake Road, an east-west dirt road, provides access to Fort Irwin from State Highway 127 in the east. Farther south along I-15 at the Afton Canyon exit, a dirt road extends north to the utility corridor. Alvord Road extends north from the Manix railhead into the Alvord Mountain area. Another unpaved road, Copper City Mine Road, begins north of the Barstow area at Fort Irwin Road and extends north to Superior Dry Lakes. A network of dirt roads extends from Copper City Mine Road and provides access into the Mud Hills area. Several dirt roads provide access into the Coyote Lake area from Fort Irwin Road. In addition, dirt roads extend into the Lane Mountain area from both Fort Irwin and Copper City Mine roads. A maintained dirt road, Saratoga Springs Road, branches west off of State Highway 127 and runs along the northern portion of the Silurian Valley section of the study area terminating at Owl Hole Springs. In addition, several unmaintained dirt roads branch off Saratoga Springs Road, many of which lead to abandoned mining operations. West of State Highway 127, a dirt road runs east and west, eventually connecting to the Boulder Utility Corridor. The Old Railroad Grade, an old railroad corridor, runs north and south in the eastern portion of the Silurian Valley section of the study area.



Explanation

- Maintained Dirt Road
- Two-Lane Paved Road
- Open Route in Closed Area
- Closed Routes
- Power/Transmission Lines

Entire Study Area
TRANSPORTATION AND ACCESS
Figure 3.14-1

Chambers Group, Inc.
5 2.5 1.25 0 5 Miles
1" = 30000'
Project# 6347
November 25, 1996

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Several miles of dirt trails also exist within the study area. Approximately 136 miles of trails are generally accessible by the unpaved road extending from Barstow to Superior Lake. Another 191 miles of dirt trails are generally accessible via Fort Irwin Road.

3.14.3 Railroad System

Regional access into and out of the Fort Irwin area is also possible by train. Both the Union Pacific and the Atchison, Topeka and Santa Fe railroads offer services into Barstow. Military equipment used in training exercises arrives by rail and is principally unloaded at the U.S. Marine Corps Yermo Annex in Barstow or the Manix railhead located along I-15 northeast of Barstow.

3.15 SOCIOECONOMICS

The socioeconomics of the proposed expansion area is based on large acreages of vacant lands and low population densities. This rural landscape is surrounded by small communities outside of the expansion area that are near enough to provide most employment opportunities to the area. These communities include a stretch of towns along I-15 from Barstow to Baker to the south of the expansion area, Shoshone and Tecopa to the north of the expansion area, and the NTC itself. The private land base within the study area that contributes to county revenues includes 95,217 acres. County revenues are estimated at $330,757 per year. Most private as well as public land is vacant. Activities occurring within the acquisition area that contribute measurably to employment and/or local economies include mining and grazing. Other activities that bring revenues to local communities include vehicular touring, hunting, camping, and other dispersed recreation activities.

3.16 EDUCATION AND RESEARCH

3.16.1 Desert Studies Consortium

California State University maintains the Desert Studies Consortium, a scientific research and educational facility. The facility is located approximately 50 miles south of the study area boundary, on the western shore of Soda Lake (dry), within the boundary of the Mojave National Preserve (National Park Service [NPS] lands). This research facility has experienced an increase in use by researchers and students in recent years because of an increasing interest in desert studies. The facility maintains records of visitors and "use" days that incorporate the length of stay of each visitor. From July 1991 through June 1992, the facility saw just under 2,000 visitors and 5,721 use days. The visitors included researchers, students, and the general public. The University, through the Desert Study Consortium, has sponsored biological research for the past 20 years on approximately 50 acres of leased land. The study site is located at Sheep Creek Springs north of the Avawatz Mountains and within the boundary of the Silurian Valley portion of the study area. The Consortium maintains a small cabin for use by researchers at the site.

3.16.2 Silurian Hills Geologic Study Area

The geology of the area east of State Highway 127 and west of Las Vegas exhibits a phenomenon known as large scale detachment faulting. The emerging knowledge of this area has been aided by recent studies of the entire area, including the Silurian Hills. The Silurian Hills have been a topic of study for geology students at California Polytechnic University, Pomona and San Luis Obispo; California State University, Fresno and San Bernardino; and the University of Southern California. Several professors from these schools use the Silurian Hills for field trips and field studies.

3.16.3 Public Lands

Public lands provide ideal field laboratories for the study of natural systems. Within the study area, geology, geomorphology, seismicity, paleontology, anthropology, and history are subjects of study by a large number of persons associated with high schools and colleges from southern California and other areas as far away as New York and North Carolina.

Studies conducted in the desert offer scientists and students a unique natural laboratory. Field experience is a social and educational benefit to researchers and potentially provides a greater benefit to the scientific community as a whole. Primary field research is required in order to understand the physical and cultural variables that have shaped the environment. This type of research develops fundamental knowledge for greater understanding of process and also builds conceptual knowledge for the development of laws and models. Scientists from the University of California support the need to preserve the natural state of the study area in order to continue conducting research and development on desert processes (Woodburne 1988; Sylvester 1988; Shreve 1988).

Sites within the study area offer a variety of physical and cultural information that continues to be studied by scientists and students nationwide. Significant resources for geological and paleontological research at Alvord Mountain, Spanish Canyon, and the southern Avawatz Mountains have been cited by many scientists. Meyer (1988) reports that many of the fossils in these areas are unique assemblages to the region and have not been thoroughly studied and understood. Whistler (1988) supports this comment and includes the Mud Hills and the West Cronese Basin as additional localities for paleontological research. Ongoing studies are presently occurring in portions of the study area. Other localities identified by University of California research professors include the Soda Mountains, Calico Mountains, Superior Lake, and Coyote Dry Lake.

Educational institutions use the study area and encompass a broad spectrum of field-oriented research topics. Academic interests include archaeology, structural and historical geology, geomorphology, paleoecology, paleomagnetics, stratigraphy, and volcanology (Jefferson 1988).

Research studies that have included these areas over a period of years are scheduled to continue collecting data at these same sites. Because of site-specific parameters being measured, some of these studies cannot be moved to other areas for continuation.

3.17 WILDERNESS CHARACTERISTICS

Wilderness characteristics, including naturalness, solitude, primitive and unconfined recreation, and special features, are presented in this section. The jurisdictional framework regarding land use in the CDCA is presented in Section 3.10, Land Use.

3.17.1 Wilderness Study Areas

The FLPMA of 1976 directed the Secretary of the Interior to review the wilderness potential of public lands under the criteria in the Wilderness Act of 1964. The BLM inventoried, studied, and reviewed nearly 17 million acres of public lands in California.

Based on the review, additional intensive studies were conducted on approximately 7.1 million acres in 209 areas in California designated by the BLM as Wilderness Study Areas. Within the CDCA, approximately 5.7 million acres in 137 WSAs were studied. In response to the recommendations initiated by the BLM and other considerations, Congress enacted the CDPA of 1994. The CDPA designated 69 wilderness areas and 8 WSAs on lands administered by the BLM. Five of the legislatively designated WSAs are within the area proposed for acquisition by the NTC. The specific WSAs are identified in the CDPA by reference to the following maps:

- Death Valley National Park Boundary and Wilderness 17-Proposed, dated July 1993
- Avawatz Mountains Wilderness-Proposed, dated July 1994;
- South Avawatz Mountains-Proposed, dated May 1991;
- Kingston Range Wilderness-Proposed, dated July 1993; and
- Soda Mountains Wilderness-Proposed 1, dated May 1991 and Soda Mountains Wilderness-Proposed 2, dated January 1989.

The WSAs located within the study area are shown on Figure 3.17-1. Table 3.17-1 provides a description of the land ownership within each WSA and the number of acres that fall within the study area boundaries.

Public lands within the WSAs are managed in accordance with the BLM Interim Management Policy for Lands Under Wilderness Review (BLM 1995). Management is presently directed toward preserving of their prospective and respective wilderness values. WSAs are managed to avoid impairment of the potential wilderness values.

3.17.1.1 Death Valley National Park Boundary and Wilderness 17 - Proposed, Dated July 1993

Area Description

The Death Valley National Park Boundary and WSA 17 is located between Fort Irwin to the south and the Death Valley National Park to the north. This WSA is approximately 60 miles north of Barstow and is accessible from I-15 via State Highway 127 and Harry Wade Road. It includes approximately 46,733 acres of public lands managed by the BLM, 1,963 acres of state lands, and 2,604 acres of private lands.

The area is characterized by three north-south mountain ranges with elevations that range from 1,695 to 4,988 feet. The ranges on the east and west appear metamorphic in nature, while the middle range shows a volcanic influence. Plant assemblages found in the area include the Mojave Creosote bush scrub and blackbush scrub located on alluvial slopes.

Potential Wilderness Characteristics

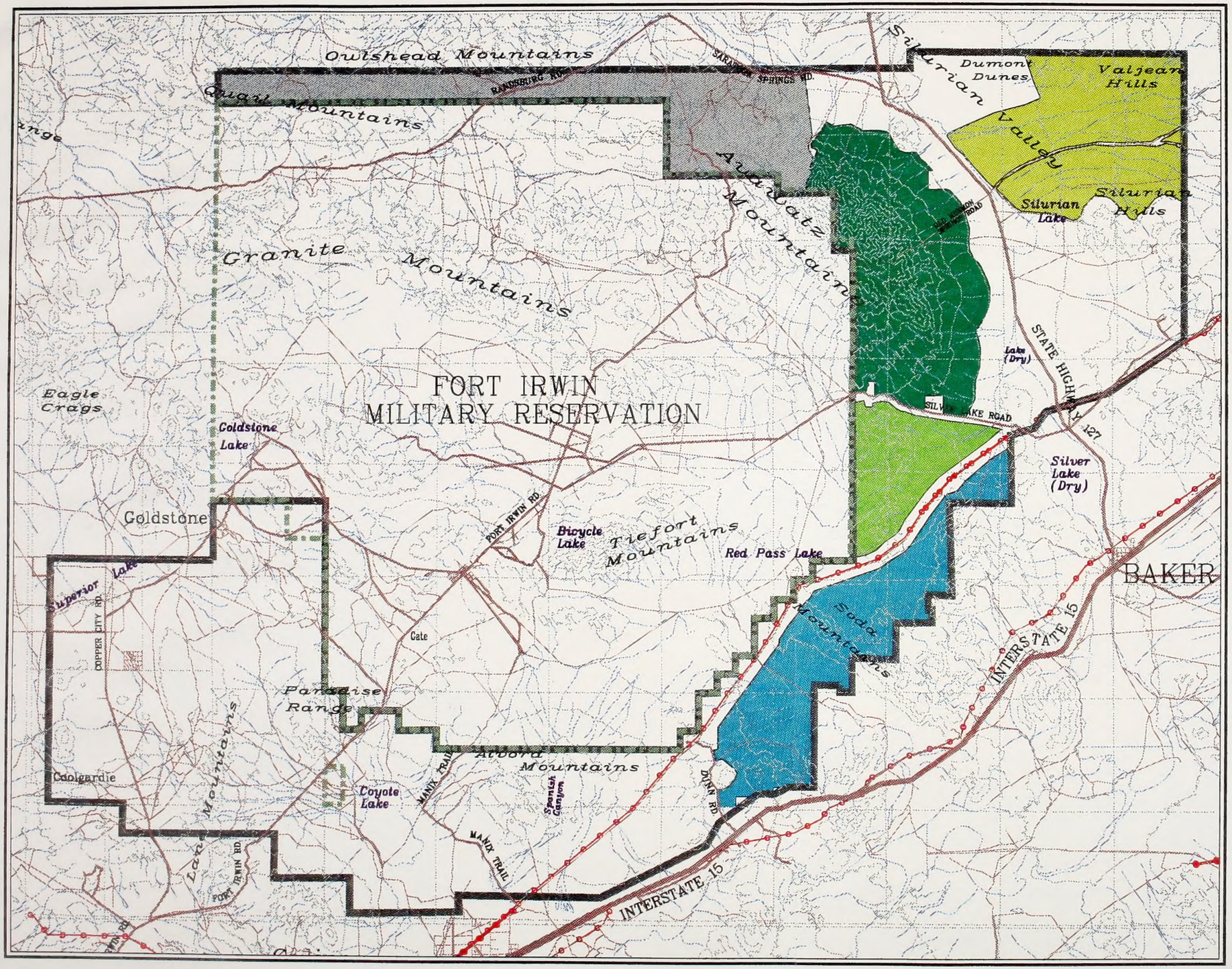
Naturalness

This area appears to have been affected primarily by natural forces and is largely undisturbed by humans. Five roads cross the area.

Solitude

The diversity of landforms creates areas of isolation and seclusion in the mountains and valleys. These opportunities for solitude are further enhanced by the area's proximity to Death Valley National Park.

This WSA is periodically overflown by military aircraft as part of the national defense mission occurring in approved military operating areas and flight corridors. The visual intrusions and associated



Explanation

- Kingston Range WSA
- Avawatz Mountains WSA
- South Avawatz Mountains WSA
- Soda Mountains WSA
- Death Valley National Park Boundary WSA
- Power/Transmission Lines

Entire Study Area
WILDERNESS STUDY AREAS
Figure 3.17-1

Chambers Group, Inc.

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1" = 30000'
Project# 6347
November 25, 1996

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Table 3.17-1

WILDERNESS STUDY AREAS WITHIN THE STUDY AREA

Wilderness Study Area	Public Lands (acres)	State Lands (acres)	Private Lands (acres)	Total No. Acres in Study Area
Death Valley National Park Boundary and Wilderness	46,733	1,963	2,604	51,300
Avawatz Mountains Wilderness	58,760	2,560	125	61,445
South Avawatz Mountains Wilderness	22,391	650	209	23,250
Kingston Range Wilderness	37,217	2,533	0	39,750
Soda Mountains Wilderness	41,393	1,100	935	43,428
Total	**206,494**	**8,806**	**3,873**	**219,173**
Source: BLM 1995				

noise create periodic temporary effects on solitude that are deemed necessary and acceptable as a part of the defense preparedness of the nation.

Primitive and Unconfined Recreation

The area allows freedom for unconfined movement. The adjacent administratively endorsed wilderness in Death Valley National Park and the unconfined character of the landscape further enhance these opportunities.

Special Features

Portions of the WSA show complete absence of evidence of the presence of humans. Scenic views within the Wilderness Area are breathtaking, as are views of Death Valley National Park.

The western one-quarter of the WSA is within the Slate Range Wild Burro Herd Management Area (HMA). Desert bighorn sheep use the far eastern portion of the WSA on a transient basis. In addition, the desert tortoise is present within the WSA in low densities, ranging from zero to 20 animals per square mile.

3.17.1.2 Avawatz Mountains Wilderness - Proposed, Dated July 1994

Area Description

The Avawatz Mountains WSA - Proposed is located within the main part of the Silurian Valley portion of the study area. It is comprised of 61,445 acres, of which 58,760 acres are public land under BLM jurisdiction, 2,560 acres are owned by the State of California, and 125 acres are private lands.

State Highway 127 lies to the east of the WSA, and Silver Lake Road makes up the southern boundary. Fort Irwin and a gravel road to Denning Springs make up the western border of this WSA.

The WSA consists of the eastern portion of the Avawatz Mountains that contain many colorful eroded slopes, rugged ridges, and steep-walled, narrow canyons. The mountains are flanked to the east by a steeply descending creosote-covered bajada that transforms into dry lakebeds near State Highway 127. White talc deposits dot the landscape, and the northern portion provides outstanding views into Death Valley National Park. The WSA contains approximately 38 percent mountains, 20 percent alluvial fans, 20 percent dissected fans, 15 percent highly dissected fans, 2 percent playas, 2 percent badlands, 2 percent hills, and 1 percent river washes. Elevations rise from 680 feet near Silurian Dry Lake to a 6,162-foot summit within a distance of only 9 miles. Vegetation

consists of a typical creosote bush scrub assemblage that exhibits some variability based on elevation.

Potential Wilderness Characteristics

Naturalness

The majority of the Avawatz Mountains WSA retains its primeval character and influence and appears to have been affected primarily by the forces of nature. Historic mining activity in the southwest portion and 25 miles of access routes have adversely affected naturalness in localized areas.

Solitude

Outstanding opportunities for solitude are available. Spaciousness on the mountain peaks and large bajadas, combined with vistas into Death Valley National Park, compliment the opportunities for solitude found in the narrow canyons and rugged mountain ridges that screen visitors from one another. On the bajadas, the lack of topographic diversity and vegetative screening can have a limiting effect on opportunities for solitude.

This WSA is periodically overflown by military aircraft as part of the national defense mission occurring in approved military operating areas and flight corridors. The visual intrusions and associated noise create periodic temporary effects on solitude, which are deemed necessary and acceptable as a part of the defense preparedness of the nation.

Primitive and Unconfined Recreation

The area provides for unconfined movement and primitive types of recreation. However, the cherry-stemmed roads and private land essentially divide the WSA into four subunits. The limiting effect of these roads and private land would be most significant to users of the creosote-covered bajadas. Lack of available water is aggravated by extreme summer heat and low humidity.

Special Features

Approximately 40 acres of the Avawatz Mountains WSA are located within the Denning Springs ACEC. The actions in the management plan for this ACEC are designed to protect significant cultural resource values. The WSA also contains approximately 75 square miles of seasonal habitat for desert bighorn sheep. Otherwise, the landforms, ecological diversity, and geological features are not unique and are typical of features that are common throughout the surrounding deserts and mountains.

3.17.1.3 South Avawatz Mountains Wilderness - Proposed, Dated May 1991

Area Description

The South Avawatz Mountains WSA is located in San Bernardino County within the central northeast portion of the CDCA. The community of Baker is 10 miles southeast of the WSA. The WSA includes 22,391 acres of public land under the jurisdiction of the BLM, 650 acres owned by the state of California, and 209 acres of private land.

This triangular-shaped WSA is bound to the north by the Silver Lake Mine Road. The northwest boundary follows a drainage system that avoids areas showing evidence of previous mining activity. The Fort Irwin Military Reservation boundary makes up the western border of the WSA. The southeastern boundary is located along an imaginary line that runs 400 feet north of three high-voltage power transmission lines, which were in place in 1979. Where the service road extends beyond the 400 feet, the boundary is the service road. The southeastern portion of the WSA is located within a 2-mile-wide utility corridor (Corridor D) designated in the CDCA Plan.

The South Avawatz Mountains WSA contains the southernmost extension of the Avawatz Mountains. The mountains are highly dissected and contain steep-walled canyons. The eastern half of the WSA encompasses a large bajada of coarse gravel and scattered boulders crisscrossed by many graveled washes. The WSA contains approximately 25 percent hills, 25 percent plains, 20 percent mountains, 10 percent dissected fans, 10 percent highly dissected fans, 5 percent alluvial fans, 3 percent pediments, and 2 percent river washes. Elevations range from 880 feet at the eastern limit of the area's bajada to a maximum elevation of 3,270 feet in the southern Avawatz Mountains.

Potential Wilderness Characteristics

Naturalness

The area is largely untraveled by humans. With the exception of several areas impacted by previous mining activity and 14 miles of existing routes of travel, the remaining area retains its primeval character and influence.

Solitude

Outstanding opportunities for solitude are available. The canyons and washes provide topographic screening and separation into enclosed spaces. The Soda and Avawatz Mountains are visible from the bajada. The unbroken view of these large features provides a psychological feeling of vastness. However, on the bajadas, the lack of topographic diversity and vegetative screening can also have a limiting effect on opportunities.

Primitive and Unconfined Recreation

The area provides for unconfined movement and primitive types of recreation. The existing routes of travel do not substantially limit opportunities. However, lack of available water is aggravated by extreme summer heat and low humidity.

Special Features

The mountainous portion of the South Avawatz Mountains WSA contains transient habitat for the desert bighorn sheep. Sheep occasionally travel between the Soda Mountains to the south and the northern Avawatz Mountains. The Old Spanish Emigrant Trail crosses the WSA in an east-west direction. Otherwise, the landforms, ecological diversity, and geological features are not unique and are typical of features common throughout the surrounding deserts and mountains.

3.17.1.4 Kingston Range Wilderness - Proposed, Dated July 1993

Area Description

The Kingston Range WSA is located in the northeastern part of the study area in the Silurian Valley. It is comprised of 39,750 acres, including 37,217 acres of public land under the jurisdiction of the BLM and 2,533 acres of state land.

The irregular southern boundary of the WSA skirts private land and mining activities. The southwestern WSA boundary winds around the Silurian Hills, primarily following dry washes and roads, but sometimes running cross-country to exclude areas of mining activity. At the north end of the Silurian Hills, the boundary follows a road around the east side of Silurian Dry Lake, emerging on State Highway 127 at the site of Renoville. The western boundary follows the highway north for 5.5 miles and then swings sharply east to exclude the Dumont Dunes OHV Area.

The Kingston Range WSA is easily accessible by two-wheel drive vehicles along State Highway 127, the Excelsior Mine Road, and via the cherry-stemmed roads to the Eastern Star Mine and Kingston Spring. OHV trails provide additional access into the interior of the study area.

The diverse terrain of the Kingston Range WSA includes several valleys, bajadas, major washes, and hills of varying form. To the northeast of the WSA is the Kingston Range proper. Some 17 miles of continuous ridgeline are above 6,000 feet, capped by Kingston Peak at 7,323 feet. The range can be described as an island of mountain environments within a sea of desert lowlands. A bajada slopes south from the Kingston Range and leads to the very broad, often steep-walled Kingston Wash. South of the wash lie the Shadow Mountains, a large series of low-lying rounded peaks with gently meandering interior canyons and numerous erosion channels. The Dumont Hills, located west of the Kingston Range, are a series of hills standing out from a highly eroded bajada that separates the range from Silurian Valley.

The vegetation is creosote bush scrub at lower elevations and pinyon-juniper woodland at higher elevations. A small stand of white fir occurs at the upper elevations north of Kingston Peak. Several UPAs are found within the WSA.

Potential Wilderness Characteristics

Naturalness

The Kingston Range WSA contains a few springs that have been developed but are still natural in appearance. Some mineral exploration activities,

including adits, posts, and monuments associated with mining claim locations, and occasional traces of vehicle use are noticeable within the WSA.

Impacts on naturalness in the WSA include examples of all the manmade features mentioned above, plus some additional ones. Over 15 miles of the old Tonapah-Tidewater Railroad line runs from north to south through the western portion of the WSA. Although the tracks and many of the ties have been removed, the railroad berm is still evident. In addition, a primitive OHV trail has developed alongside the old railroad berm and has become a popular OHV tour route. Silurian Valley is located between the railroad grade and State Highway 127 on the WSA boundary and is laced with a network of OHV trails, many of them originating at the Dumont Dunes OHV Area immediately to the north.

Abandoned homesites are scattered throughout the area at the old townsites of Sperry, Valjean, and Dumont and in isolated outlying areas. These sites typically consist of piles of debris and the collapsed, rotting remains of old structures.

Solitude

Aided by topography and low visitation, opportunities for solitude are present throughout the area. At present, human use is limited to fall hunting, mineral exploration and development, and trips to maintain ranch improvements.

This WSA is periodically overflown by military aircraft as part of the national defense mission occurring in approved military operating areas and flight corridors. The visual intrusions and associated noise create periodic temporary effects on solitude that are deemed necessary and acceptable as a part of the defense preparedness of the nation.

Primitive and Unconfined Recreation

The area presents opportunities for hiking, hunting, nature study, and photography. One of the most interesting features of this area is the superb long-distance view framed by the granite boulders and wooded slopes of the Kingston Mountains. Kingston Peak is recognized as a challenge for climbers and is included on the Sierra Club's list of "California Desert Peaks."

Within the WSA, quality primitive recreational opportunities are available at the Amargosa Canyon and Salt Creek Hills ACECs. The rest of the WSA contains vast expanses of featureless landscape. While the landscape presents no barriers to constrain primitive recreation, it also provides nothing to attract such use.

Special Features

The Kingston Range WSA has numerous special features that occur in certain portions of the WSA.

Several geologic formations within the Kingston Range WSA are important for the fossils they contain. The oldest is the Pahrump Group estimated at an age of 1,200 million years. The Pahrump Group is highly important to the study of evolutionary development. The local strata within the WSA is one of the few places where rocks spanning the transition between the Pre-Cambrian and Cambrian ages are displayed.

Even though the Amargosa Canyon ACEC is not within the study area, it will be briefly described here because of its proximity to the study area. Permanent flowing water and associated wetland habitats in the Amargosa Canyon ACEC provide food, cover, and nesting habitat to a great variety of birds. Several fishes, mammals, insects, and mollusks inhabiting the Amargosa River drainage have very limited distributions or low populations.

The Amargosa Canyon ACEC's permanent flowing water has attracted humans for at least 8,000 years. Four distinct aboriginal cultural complexes are represented here: Paleo-Indian, Lake Mohave/Pinto, Amargosa, and Shoshonean. Identifiable remains include sleeping circles; gravel figures; chopper tools; worked flakes; a variety of diagnostic projectile points, including Pinto, Gypsum, Elko, and Rose Springs; metates; mortars; pottery; scrapers; and pendants. Additional cultural resources exist in the canyon, but little formal work has been conducted here to date.

Amargosa Canyon has also been the scene of important historical developments. The first was the establishment of the Old Spanish Trail around 1830. This trail became a major Spanish supply route and served as a primary means of entrance into California until well after the Spanish/Mexican period. The trail was used by large numbers of immigrants, traders, miners, and horse and mule pack trains. A portion of

the Tonopah and Tidewater Railroad line, built to transport borax from the Death Valley region, was constructed through the canyon around 1906. The line was used until approximately 1940. The rails were removed during World War II, and all bridges have vanished from the effects of weathering, erosion, and vandalism. However, the railroad grade remains very evident to this day. Both the railroad line and the Old Spanish Trail played important roles in the settlement and development of California.

Within the Salt Creek Hills ACEC, Salt Creek is one of very few streams in the California desert situated on a valley floor rather than on a mountain or in a deep, rocky gorge. Subterranean water is forced to the surface at this point and runs intermittently for approximately 1 mile. The water and associated vegetation support a variety of wildlife species that do not occur in nearby drier habitats. Breeding bird surveys show that bird densities are many times higher and contain higher species diversity than other desert habitats.

3.17.1.5 Soda Mountains Wilderness Proposed 1, Dated May 1991 and Soda Mountains Wilderness Proposed 2, Dated January 1989

Area Description

The Soda Mountains WSA is located in San Bernardino County within the north-central portion of the CDCA. The community of Baker is less than 1 mile from the southeastern edge of the WSA. The portion of the 86,378-acre WSA found within the study area amounts to approximately 43,428 acres, which includes 41,393 acres of public land, 1,100 acres owned by the state of California, and 935 acres of private land.

The northern boundary of the WSA is the gravel Silver Lake Mine Road and an imaginary line that runs 400 feet south of three high-voltage transmission lines that were in place in 1979. Where the service road extends beyond 400 feet, it becomes the boundary. A gravel road forms the western boundary except where the boundary deviates to avoid two active quarries. The southern boundary generally parallels I-15, following topographic lines and a powerline maintenance road. State Highway 127 forms the eastern boundary. Portions of the WSA are located within a utility corridor (Corridor D) designated in the Desert Plan.

The Soda Mountains WSA contains approximately 35 percent mountains, 30 percent alluvial fans, 10 percent hills, 10 percent playas, 5 percent sand-covered fans, 5 percent dissected fans, 3 percent sand-covered plains, 1 percent highly dissected fans, and 1 percent sand-covered dissected fans. The topography of the WSA varies from several gently sloping bajadas to the rugged terrain of the Soda Mountains. This highly eroded mountain range has jagged ridges and sharp peaks that reach 3,663 feet in elevation. The associated canyons have steep rocky walls that vary in color from brown at the base to red in the center and gold near the top. Within the range are large interior valleys created by erosion. The bajadas are interlaced with washes and slope away from the mountains toward the WSA's boundaries. The West Cronese, East Cronese, and Silver Dry Lakes are within the WSA. However, the dry lakebeds with elevations of 1,080, 1,080, and 907 feet, respectively, are not the lowest points in the WSA. The northern bajada slopes to 880 feet at the northern boundary of the WSA.

Vegetation consists primarily of creosote bush scrub and salt bush/greasewood scrub communities. The latter community occupies lower elevations of alluvial fans, while creosote bush scrub occurs on more upland areas. Approximately 90 percent of the 7,257-acre Cronese Lake ACEC is within the boundaries of the WSA. This ACEC is located outside the southeast boundary of the study area.

Potential Wilderness Characteristics

Naturalness

Excluding the cherry-stemmed roads and mining activity, the Soda Mountains WSA has been affected primarily by natural forces with man's imprint remaining substantially unnoticeable. Some evidence of previous mining activity occurs in individual canyons. An abandoned segment of the Tonopah and Tidewater Railroad grade bisects Silver Dry Lake along the eastern edge of the WSA. Currently, 24 miles of existing routes of travel in the WSA are kept open by the passage of vehicles. Several other routes of travel, primarily in the Cronese Basin area, are closed to vehicle traffic to protect sensitive resource values.

Solitude

Outstanding opportunities for solitude are available because of the area's large size and variation in landform. The large mountainous mass that comprises the Soda and Cronese Mountains, plus the large expansive alluvial fans, provides many canyons and washes where individuals are completely isolated from evidence of human activities. However, in some portions of the alluvial fans where topographic screening is lacking, opportunities for solitude can be somewhat limited. Also, the high-tension power transmission lines create a distinct linear, unnatural feature along the entire northern border.

Primitive and Unconfined Recreation

Overall, the area provides outstanding opportunities for unconfined movement and primitive types of recreation. The limiting effect of the existing routes of travel is minor. However, the cherry-stemmed roads do constrain recreational opportunities in the north-central portion of the area. In addition, during the summer, the lack of available water is aggravated by extreme heat and low humidity.

Special Features

The Cronese Basin contains significant cultural resources and Native American concerns. These values are currently managed and protected by the Cronese Lakes ACEC, which lies outside of the study area. Two sensitive plant species, *Androstephium breviflorum* and *Linanthus arenicola*, are present on the south boundary of the area. However, neither plant has any official status. The mountainous area is used by desert bighorn sheep on an intermittent basis.

3.17.2 Wilderness Areas

No designated wilderness areas are within the study area. The Hollow Hills Wilderness and Saddle Peak Hills Wilderness are located just outside the study area near the northeast and southeast boundaries, respectively. At the northeast corner, the study area forms a common boundary with the designated Kingston Range Wilderness. Along the north boundary, the study area forms a common boundary with designated wilderness within Death Valley National Park.

3.18 AIRSPACE

The airspace in the vicinity of the NTC is currently subject to a variety of special uses serving both military and civil aviation. These uses are categorized and described below.

3.18.1 Military

3.18.1.1 Special Use Airspace

The NTC is located within the boundaries of the restricted airspace areas R-2502 North and R-2502 East. Military Operations Areas (MOAs) border the NTC along the north, east, and south. The R-2515 and R-2524 restricted airspace areas border the western portion of the NTC. These special use airspace areas are part of the R-2508 Complex. The entire complex is a tri-service airspace facility used by the DOD for training and the advancement of weapons systems technology. It covers approximately 17,000 square miles of California's northern Mojave Desert and areas of the Sierra Nevada and normally extends from the surface to an altitude of 60,000 feet MSL. Large portions of the airspace are routinely released to the Federal Aviation Administration (FAA) for joint use.

3.18.1.2 Visual Flight Routes

Visual flight routes (VRs) are established to provide specified routes for military aircraft to use when traveling between bases and operations areas. When using these routes, pilots practice evasive tactics that may include high-speed flight, erratic course changes, and low-level flight. Since the closure of George AFB, airspace is now under the jurisdiction of Edwards AFB, located about 50 miles southwest of the NTC (Ulmer, U.S. Department of the Air Force, personal communication 1992).

Four low-level VRs, illustrated on Figure 3.18-1, are in the vicinity of the NTC. The VRs are scheduled and used by Edwards AFB. VRs are also used by military aircraft from other bases. Altitudes of all four VRs vary from 100 to 1,500 feet above ground level.

VR-1214 and VR-1215 lie east of the existing eastern boundary of the NTC. The two routes follow identical paths southeast of the NTC and then diverge with VR-1214 continuing north to the Nellis Range Complex in Nevada and VR-1215 continuing northwest to several other military ranges.

VR-1217 and VR-1218 both provide access to the Superior Valley Range described below. They run generally in an east-west direction, terminating at the southeastern entrance to the range.

3.18.1.3 Contact Points

Contact points are areas just outside of the NTC from which Air Force fighter aircraft initiate maneuvers in support of ground engagements within the NTC. When necessary, pilots will hold over these areas while awaiting instructions to enter the combat zone. The contact points are located close enough to the NTC to allow rapid strikes while using terrain to visually shield the aircraft from unfriendly forces. Consequently, aircraft may be at relatively low altitudes in the vicinity of the contact points. Average altitudes are 1,500 to 6,000 feet above ground level; however, they may be as low as 300 feet or as high as 12,000 feet. Three contact points associated with the NTC could be affected by various expansion alternatives. They are identified on Figure 3.18-1 as Yuma, Dallas, and Miami.

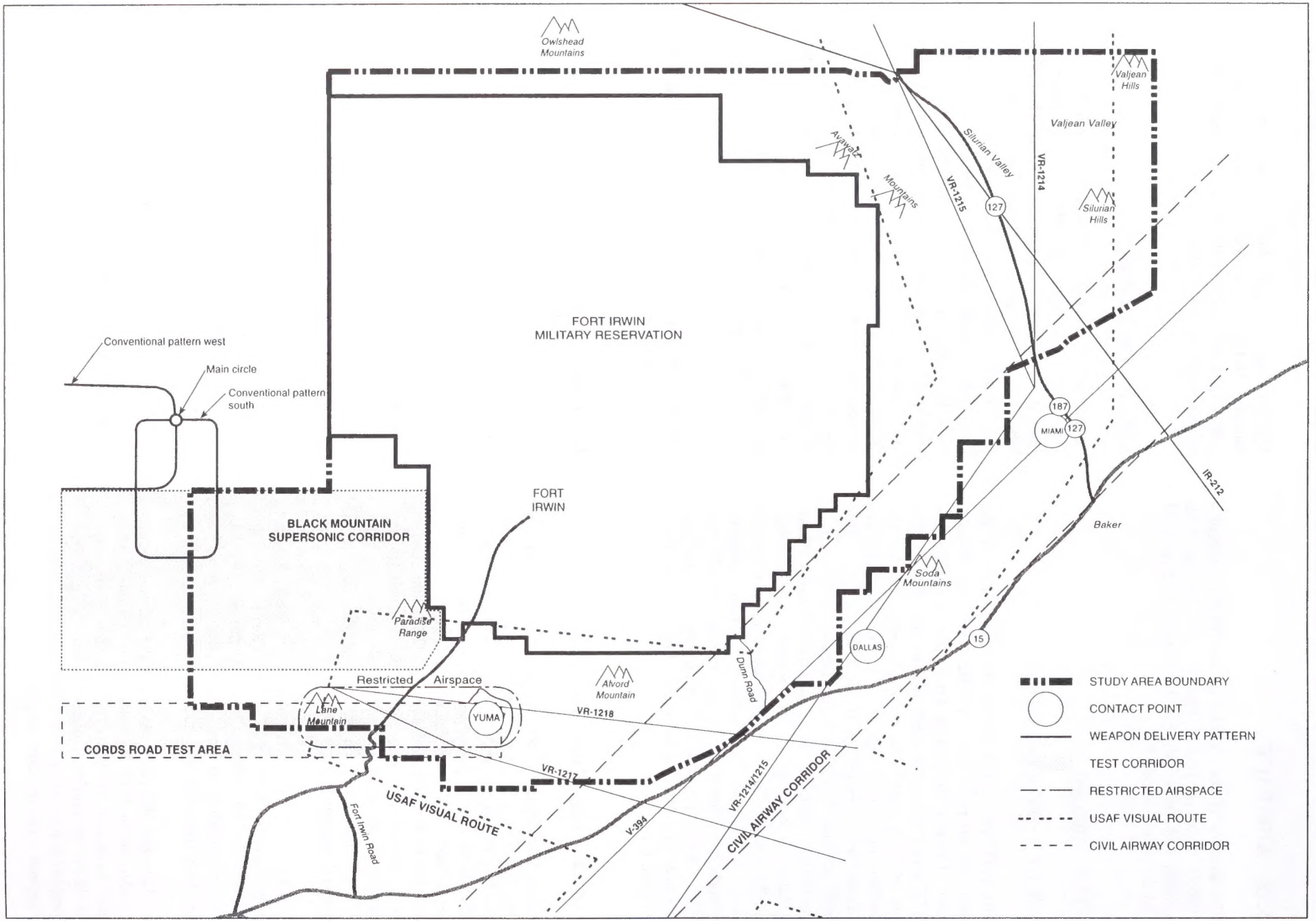
3.18.1.4 Superior Valley Air-to-Ground Gunnery Range

This range is used by aircrews to develop and maintain skills required to deliver bombs and other ordnance under combat conditions. Two separate flight patterns could potentially be affected by expansion of the NTC: conventional pattern south and conventional pattern west (see Figure 3.18-1).

The conventional patterns (south and west) are used by aircrews for proficiency training in delivery of conventional weapons including bombs, rockets, and strafe. Pattern altitudes range from 3,000 to 10,000 feet (10,500 feet for the west pattern) above ground level.

3.18.1.5 Air Force Flight Test Center Areas

All of the military airspace use that falls within the restricted airspace R-2515 boundaries are under direct control of Edwards AFB. Two additional areas of concern, described below and illustrated on Figure 3.18-1, are under the control of the Air Force Flight Test Center at Edwards AFB.



AIR CORRIDORS AND THE SUPERIOR VALLEY AIR TO GROUND GUNNERY RANGE
Figure 3.18-1

The Cords Road Test Area is a low-level corridor stretching about 80 miles along an east-west alignment. It is used as a visual alignment reference for radar tests with multiple target aircraft flying head-on to the test aircraft. Its western end is just north of Mojave Airport; its eastern end is at Coyote Lake, about 5 miles south of the existing NTC boundary.

The Black Mountain supersonic corridor is a low- to medium-level altitude test corridor 8 nautical miles wide. The floor of this corridor is 500 feet above ground level; no upper limit exists. The corridor ends just southwest of the NTC.

The restricted airspace R-2515 has a holding point that is used as a visual ground reference point to anchor aircraft awaiting orders to go in and out of battle out of line-of-sight of opposing forces. The holding point for R-2515, Ventura, is shown on Figure 3.18-2.

3.18.2 Civilian

The airspace bordering the northern and eastern sides of the NTC is layered into three types of airspace starting at the surface with Class G airspace (uncontrolled), followed by Special Use Airspace, and capped by Class A airspace (controlled).

The Class G airspace originates at the surface of the area and extends upward to an altitude of 200 feet above ground level. Aircraft operating in this airspace must meet the requirements for instrument flight rule (IFR) flight, but normally operate under visual flight rule (VFR) conditions. General civil aviation traffic is limited in this area because FAA Regulations require those pilots to remain at least 1,000 feet (2,000 feet in designated mountainous terrain) above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown.

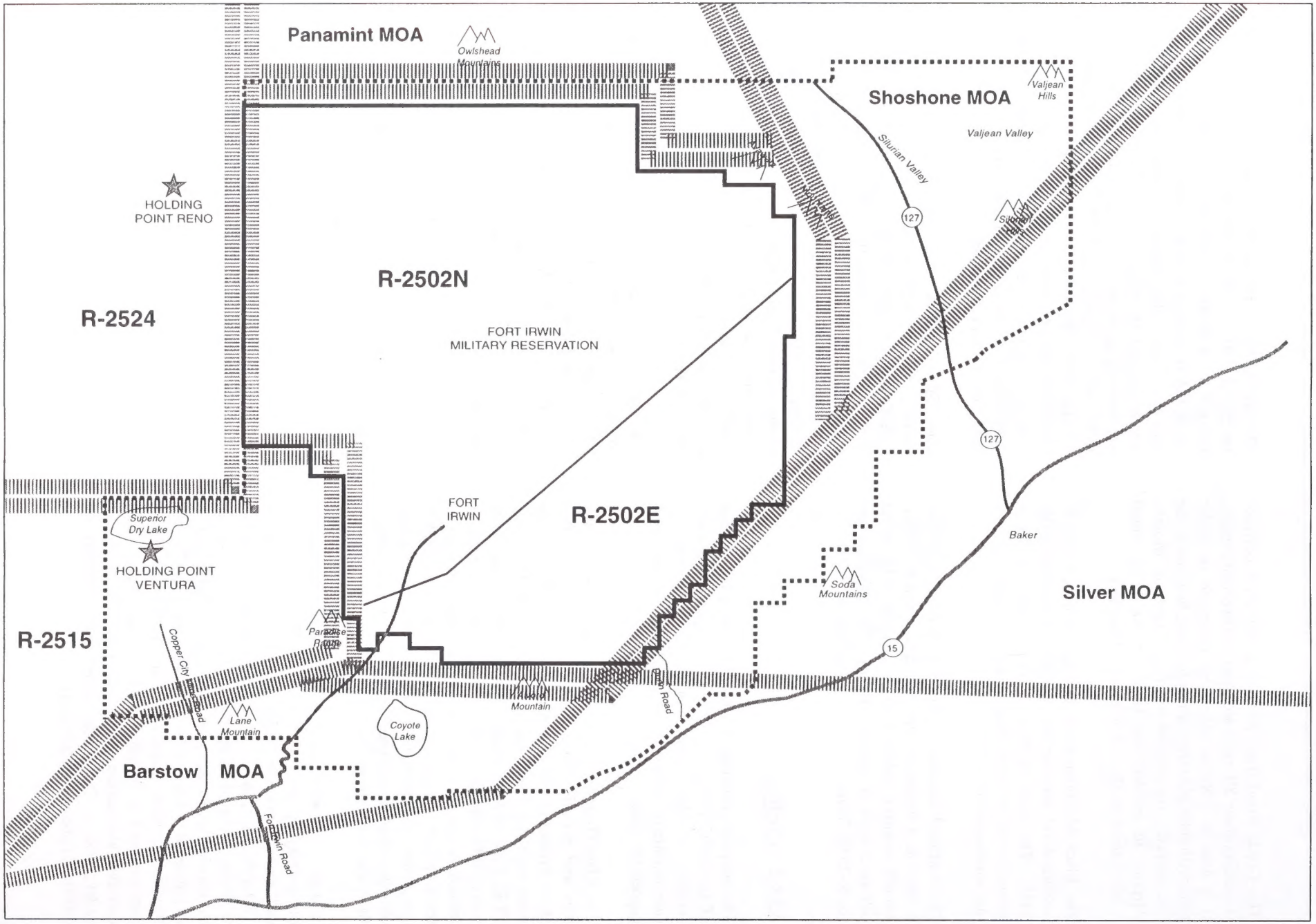
A series of airways have been established throughout the country by the FAA for use by both commercial and general aviation (private) aircraft. Known as Victor Airways, they connect ground-based navigation facilities. One of these, designated as V-394, skirts the existing southeastern boundary of the NTC. V-394 originates at Los Alamitos and continues to Las Vegas, forming the most direct route for civil aircraft flying between the Los Angeles and Las Vegas areas. The minimum altitude for aircraft operating along this route under IFR is 7,500 feet above MSL (5,000 to 6,000 feet above ground level).

The Special Use Airspace is classified as an MOA and begins at 200 feet above ground level and extends upward to an altitude of 18,000 feet mean sea level. An MOA is an area through which civil aircraft may fly, but where pilots should be aware that military operations may be taking place. The MOAs serve to separate/segregate military flight activities from IFR traffic and to identify for VFR traffic where military flight activities are being conducted. It differs from a restricted area as described above, which is airspace that a civil pilot may not enter without specific permission. In addition to China Lake, most of the NTC lies within a restricted area as well.

The "Silver" MOA covers all of the southeastern portion of the proposed land acquisition area and extends north to approximately 5 kilometers north of Silver Lake. The "Shoshone" MOA covers all of the northeastern portion of the proposed acquisition area and extends south to border the "Silver" MOA. The "Panamint" MOA covers the extreme northern portion of the proposed acquisition area and extends east to border the "Shoshone" MOA at a point over the Avawatz Mountains. The "Barstow" MOA covers the area southeast of the NTC. The MOAs are shown on Figure 3.18-2.

IFR traffic transits the MOAs using three published routes: V-394 (9,500 to 12,500 feet MSL), V-587 (10,000 feet MSL), and IR-212 (100 to 1,500 feet above ground level, Military Training Route). All portions of the Death Valley National Park are excluded from the MOAs by having a minimum overflight altitude restriction of 3,000 feet above ground level.

The Class A airspace originates at 18,000 feet MSL and extends upward to an altitude of 60,000 feet MSL. Aircraft operating in this airspace must meet the requirements for IFR flight and operate solely under IFR conditions. Upper portions are routinely released to the FAA for joint use.



MILITARY OPERATIONS AREAS (MOAs) AND RESTRICTED AREAS
Figure 3.18-2

3.19 AESTHETICS/VISUAL RESOURCES

The BLM uses a system of visual resource management (VRM) in the classification of its lands (BLM, VRM Program 1980). This system takes into consideration factors such as scenic quality (landscape character), including special interest areas, visual sensitivity (public's concern for scenic quality), and proximity to viewers (distance zone). Scenic quality and visual sensitivity have been determined and mapped through BLM study (BLM, VRM Classification Map 1980). These maps also consider distance zone views based on foreground/ middleground views to 3 to 5 miles distant, background views up to 15 miles distant, and areas that are not visible in these zones or are seldom seen. Atmospheric conditions can vary the viewing distances such that distant views may not be possible.

Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Class I is the most valued and is assigned to those areas where a management decision has been made to maintain a natural landscape. This includes areas such as national wilderness areas, the wild section of national wild and scenic rivers, and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II represents the next level under most valued, Class III represents a moderate value, and Class IV is of least value. These levels are assigned through BLM resource management planning in accordance with BLM guidelines for VRM (BLM, VRM Manual 8400 1975).

The study area is comprised of areas of VRM Class II, III, or IV lands. The VRM class management objectives for these three classes are as follows:

- Class II - The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any change must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

- Class III - The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- Class IV - The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic elements.

For the analysis of visual impact, the WSA is considered by BLM to represent the area of potential impact. The aesthetic impacts of the proposed project also have implications to wilderness values (see also Section 3.17).

3.19.1 Area-Specific Characteristics

The study area consists of a scenic environment generally characteristic of the Mojave Desert. The landforms consist of valleys, alluvial fans, hills, steep mountains, and vestiges of volcanic rock formations. The vegetation is sparse, low in profile, and generally dispersed evenly over the valley, alluvial fans, and hillsides. Various undistinguished natural drainage ways intersect the valley areas, and a number of major and smaller dry lakebeds are generally barren and devoid of visible life.

The colors of the desert landscape range from dark grays and brown to light tans and light green. Textures are medium to coarse for mountain/hill areas, and smooth to fine for valley, alluvial fan, and wash areas. Generally, the study area is relatively untouched by man. Other than highly visible, "strongly" contrasting power poles located along a utility corridor, no known architectural structures of scenic significance exist. Additional manmade features include infrequent dirt roads and trails generally located within the valley area, a small number of mining operation sites, a rock quarry operation site,

and paved Irwin Road. In addition, State Highway 127 lies adjacent to the east, and Interstate I-15 and an Amtrack railway lie immediately to the south.

Visual classes affected for those areas containing BLM lands within the study area are Class II, III, and IV as shown on Figure 3.19-1. The "Scenic Quality" within these three classes is either A, B, or C, with an A rating being the highest possible rating and C the lowest. Sensitivity levels range from high to moderate, with no low-sensitivity areas classified within the study area. Classes are further evaluated based on their distance from key observation points (KOPs). Distance zones are categorized by "foreground-middleground, background, and seldom seen."

The following is a general description of classifications and ratings applied to VRM areas that would be affected by proposed actions. Included are scenic quality, sensitivity levels, and distance zone ratings and classification.

Location	VRM Class	Scenic Quality	Sensitivity Level	Distance Zone
Avawatz Mountains	III/IV	B	H	Bg
Avawatz Alluvial Fan	II	B	H	Fg
Silver Lake	III	C	H	Fg
Soda Mountains	IV	C	H	Bg
Fan S. of Soda Mountains	III	B/C	H	Fg
Cronese Drainage	III/IV	B	H/M	Bg
Alvord Mountains	IV	B	M	Bg
Alvord Mountains Fan	IV	C	M	Fg
Coyote Basin	IV	C	M	Fg
Lane Mountains	II	B	H/M	Fg
Superior Valley	IV	C	M	Bg/Fg
Owlshead	III	C	H	Fg
Kingston Range	II/III	B	H	Bg/Fg
Salt Creek Hills	II	A	H	Fg
Silurian Valley	II/III	B/C	H	Fg
South Saddle Peak	II	B/C	H	Fg
Dumont Dunes*	II	A	H	Fg

***Just outside, but adjacent to study area**

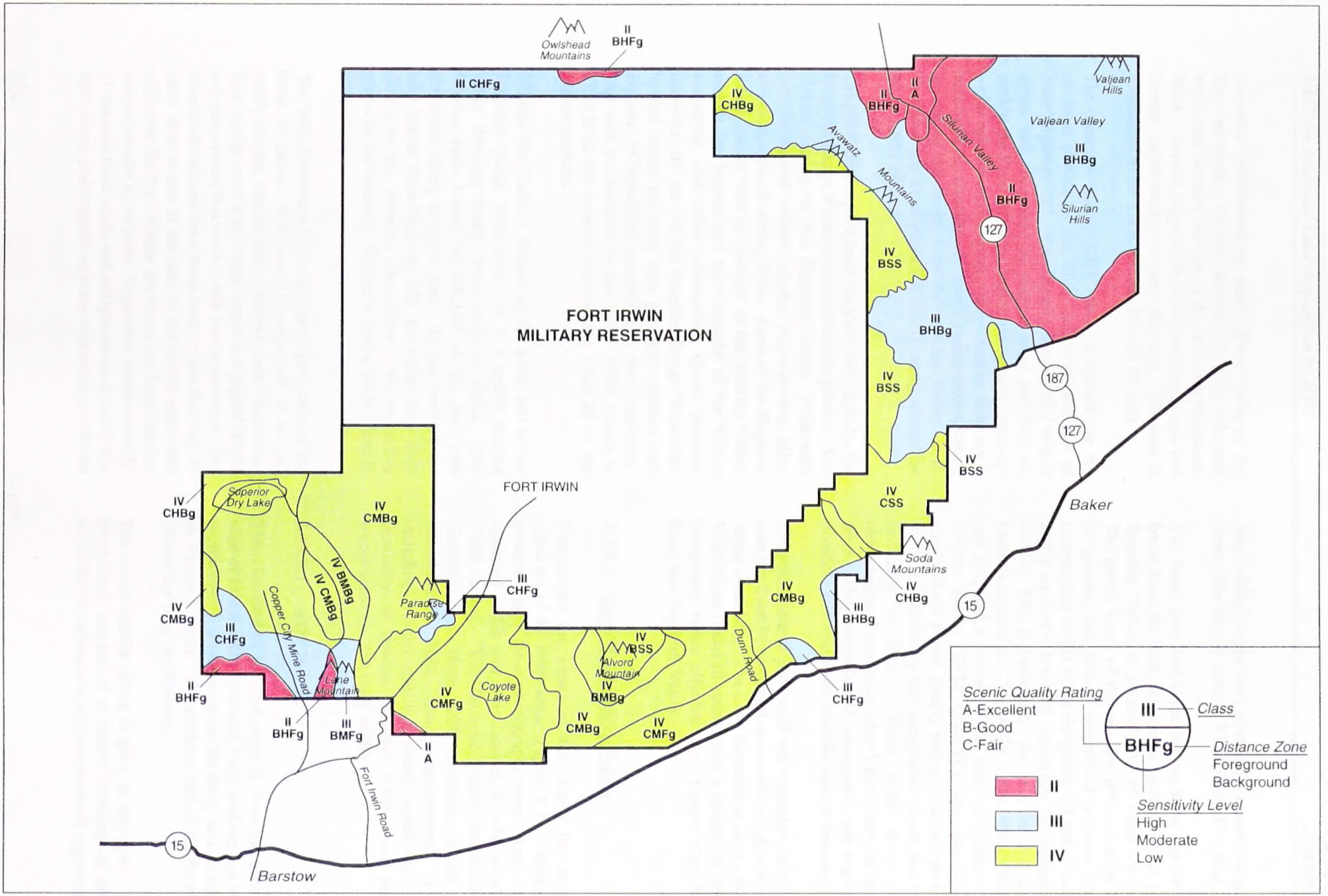
Key: Scenic Quality: A = high, B = intermediate, C = low
Sensitivity Level: H = high; M = moderate
Distance Zone: Bg = Background; Fg = foreground/middleground

The portion of the study area that includes the north, east, and southeast areas is within the north-central portion of the CDCA between Death Valley National Park to the north and the existing Fort Irwin Military Reservation to the south. Primary access to the area is State Highway 127 off of I-15 at Baker. The study area comprises a mix of areas containing a variety of aesthetic features. The area is generally typical of other Mojave Desert regions. A mix of mountains, alluvial and dissected fans, playas, badlands, hills, and river washes generally undisturbed by human intrusion comprise the area. The study area is comprised of several BLM WSAs and ACECs, as well as an OHV area, each containing its own visual characteristics.

The Silurian Valley portion of the study area is periodically overflown by military aircraft as part of the national defense mission taking place in approved MOAs and flight corridors. The visual intrusions of these actions are taken into consideration as part of the BLM VRM class rating system.

The northwestern portion of the study area includes part of Death Valley National Park Boundary WSA. This area comprises about 51,300 acres. Significant scenic values within the greater park include the stark, white, dry lakebeds (for Owl and Lost dry Lakes north of the Silurian Valley) with orange, tan, and gray jagged mountains forming a backdrop. Vistas of the Amargosa River drainage and Death Valley also provide aesthetic opportunities, as does the Quail Spring area, which is particularly noted for its riparian habitat and variety of avifauna. The Owlshead Mountains to the north and the Avawatz Mountains to the southeast both form jagged visual backdrops from this area, looking to the north and southeast, respectively. This portion of the Owlshead area, however, includes dirt roadways that lead to a microwave facility and mines to the west that are a minor visual distraction from the otherwise primitive character of the adjacent area.

The Avawatz Mountains WSA and the Avawatz Mountain range border the northeastern edge of Fort Irwin. The area is comprised of mountains, alluvial and dissected fans, playas, badlands, hills, and river washes. The Avawatz Mountains offer visual contrast in landforms and scenic opportunities for travelers along State Highway 127 and contain many colorful eroded slopes, rugged ridges, and steep-walled, narrow canyons. The mountains are flanked to the east by a steeply descending creosote-covered bajada that transforms into dry lakebeds near State Highway 127. Spaciousness on the mountain peaks and large bajadas combines with vistas into Death Valley National Park as visual features. The bajadas, however, lack topographic and vegetative diversity. White talc deposits dot the landscape at intervals, and the northern portion provides outstanding views into Death Valley National Park. Elevations rise from 680 feet near Silurian Dry Lake to a 6,162-foot summit within only 9 miles. Most of this area retains a natural



VISUAL RESOURCE MANAGEMENT CLASSES WITHIN THE STUDY AREA
Figure 3.19-1

character undisturbed by man. Forty acres of the Denning Springs Cultural Resource ACEC are located within the western portion of the Avawatz Mountains WSA. Several large north-south trending ridges and several major washes traverse this area. The area is considered to be a VRM Class III and IV area.

The Dumont Dunes OHV area is located on the northern portion of the study area west and east of State Highway 127. The Dumont Dunes OHV area is scenic and comprised of craggy peaks and hills set against the Dumont Dunes that stand out as a cream-to-white colored dune system. The Dumont Hills are a series of hills standing out from a highly eroded bajada separating the range from the Silurian Valley itself. This area has been given a Class II rating within the BLM VRM system.

The northeastern portion of the study area includes the Kingston Range Wilderness southwestern portion. The diverse terrain of the Kingston Range Wilderness includes several valleys, bajadas, major washes, hills, and mountains of varying form. Areas of the Kingston Range proper that are outside of the Silurian Valley include the highest and most colorful of the WSA's mountains and other outstanding visual features. However, the area of the Kingston Range Wilderness located within the study area generally contains vast expanses of featureless, generally flat desert landscape. This area is classified by the BLM VRM system as Class II in the western portion and Class III in the eastern portion.

Silurian Dry Lake is located at the south end of the Kingston Range Wilderness. It is a gently sloping valley draining slowly from south to north. The Silurian Hills bound the lakebed on the east with elevations rising to 2,992 feet. To the west of the lake, across State Highway 127, the valley floor rises slowly to the Avawatz Mountains. No vegetation grows in the lakebed. This is within a VRM Class II designation.

The Soda Mountains WSA is located just north of the town of Baker. This area is comprised of several gently sloping bajadas to the rugged Soda Mountains. This highly eroded mountain range has jagged ridges and sharp peaks that reach 3,663 feet in elevation. The associated canyons have steep rocky walls that vary in color from brown at the base to red in the center and gold near the top. Within the range are large interior valleys created by erosion. Vegetation consists mainly of creosote bush scrub and salt/greasewood scrub, the latter being predominant on lower elevations of alluvial fans, while cresote bush scrub occurs more on upland areas. The area is given a VRM Class IV rating.

The study area that abuts the southern end of Fort Irwin from the Soda Mountains south and west to the Superior Valley is primarily VRM Class IV lands. The public views of the area are afforded from I-15. In general, the area is considered to have low to intermediate levels of scenic quality (B and C ratings) and a moderate level of sensitivity for background views. This is particularly the case for the Alvord Mountains and Fan, Cronese Drainage (VRM Class III and IV), and a portion of the Superior Valley. The Coyote Basin (VRM Class IV) also has low to intermediate scenic quality ratings but has moderate levels of sensitivity for foreground views due to its proximity to I-15. These areas have visual characteristics similar to other VRM Class III and IV areas. They basically lack topographic and vegetative diversity and exhibit no specific special features.

The southwestern portion of the expansion study area near the Lane Mountains does contain a higher level of visual sensitivity. The Lane Mountain area is a mix of VRM Class II and III ratings with a sensitivity toward foreground views afforded from Copper City Mine Road into Superior Valley.

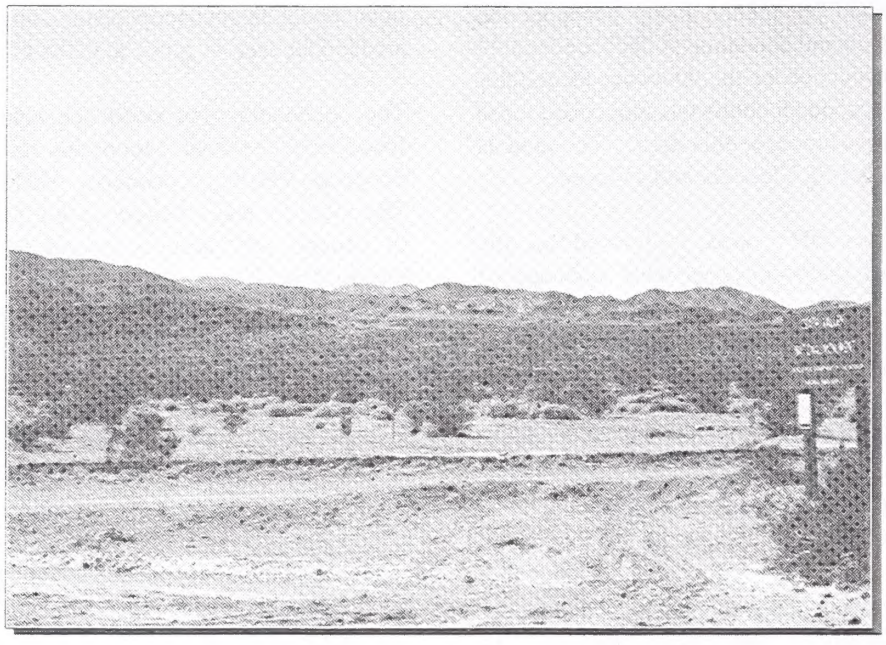
3.19.2 Key Observation Points

Photographs are presented that depict the existing character of the study area. Figure 3.19-1 shows the location where these photographs were taken. They represent KOPs and their location in relation to the VRM classes. The discussion below describes the viewshed from these KOP locations, taking into consideration BLM visual measurement factors including scenic quality, visual sensitivity, and proximity to viewers (distance zones) from public access areas (in this case, roadways).

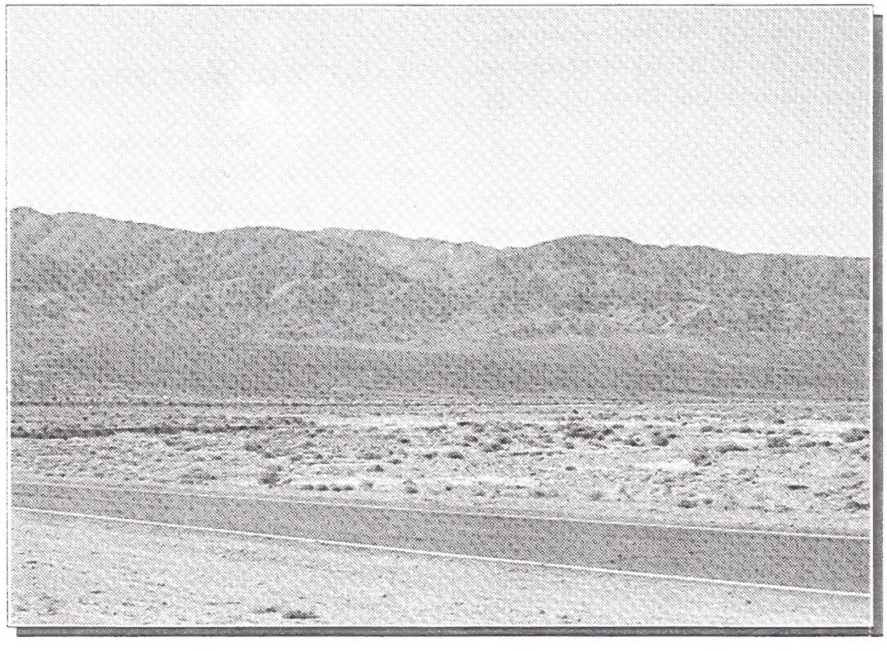
3.19.2.1 KOP No. 1

This viewshed of the study area is from the southern edge of Death Valley National Park, looking in a west-southwesterly direction across the study area as shown on Figure 3.19-2a. The northern end of the Avawatz Mountains is in the distance.

The scenic quality rating is good in this area. The foreground consists of a sparse covering of desert scrub that contributes to a coarse-textured appearance.



A. Key Observation Point 1.
View from southern edge of Death Valley looking southwest.



B. Key Observation Point 2.
View from Highway 127 at north end of study area
looking southwest at Avawatz Mountains.

KEY OBSERVATION POINTS
Figure 3.19-2

The texture of the terrain is broken in the immediate foreground by the dirt roadway and in the distance by the Avawatz Mountains. Color includes a variety of tones. The foreground includes the greens/yellows and brownish scrub variations, while the background mountains include shades of mauve, blue, browns, and gray, depending on atmospheric and lighting conditions. The areas in the foreground and background of this KOP are assigned a high sensitivity level by the BLM VRM system.

With a good scenic quality rating, the area shown has a VRM Class III rating with a high sensitivity level for background views.

3.19.2.2 KOP No. 2

This viewshed is from State Highway 127 at the north end of the study area. The view is to the southwest looking on the study area across to the Avawatz Mountains and is shown on Figure 3.19-2b.

The terrain includes the flatter desert in the foreground with gently sloping middleground to the steep mountains in the background. The texture includes a combination of spotty foreground vegetation and a smoother visual combination of desert/vegetation in the middleground transitioning to the jagged appearance of the Avawatz Mountains in the background. Colors also include a variety of tones and hues, depending on light and atmospheric conditions. This variety can include the yellow/browns and green shades of the foreground vegetation, the lighter to darker browns of the desert sand, and the darker blues, mauves, and grays of the mountains.

This KOP encompasses two VRM classes: Class II in the foreground and Class III for the mountains in the background. Both are rated good for scenic quality and both have a high sensitivity level given the viewing location from State Highway 127. The Class II area is rated with a high sensitivity level from the foreground viewshed, while the Class III area is rated with a high sensitivity level for the background viewshed.

3.19.2.3 KOP No. 3

This viewshed is from State Highway 127 in the northern portion of the study area looking north. Salt Creek Spring is in the middleground, and the Salt Spring Hills are in the background as shown on Figure 3.19-3a.

In accordance with the VRM system, the area has an excellent scenic quality rating and a high level of sensitivity because of its view accessibility from State Highway 127. From this viewpoint, changes in landform can be seen both in the middleground and backgrounds. The foreground includes a spotty mix of desert scrub in varying shades of green and brown/yellow. This is broken by the desert sand that contrasts with the darker green riparian vegetation next to Salt Creek Spring. Some hardened sand formations adjacent to Salt Creek Spring are also prevalent in the middleground and appear as light-colored areas because of their being low in texture/vegetation. These are contrasted by the middleground hills of darker brown and muted grays. Background hills have tones of blues, mauves, and grays, depending on atmospheric and lighting conditions.

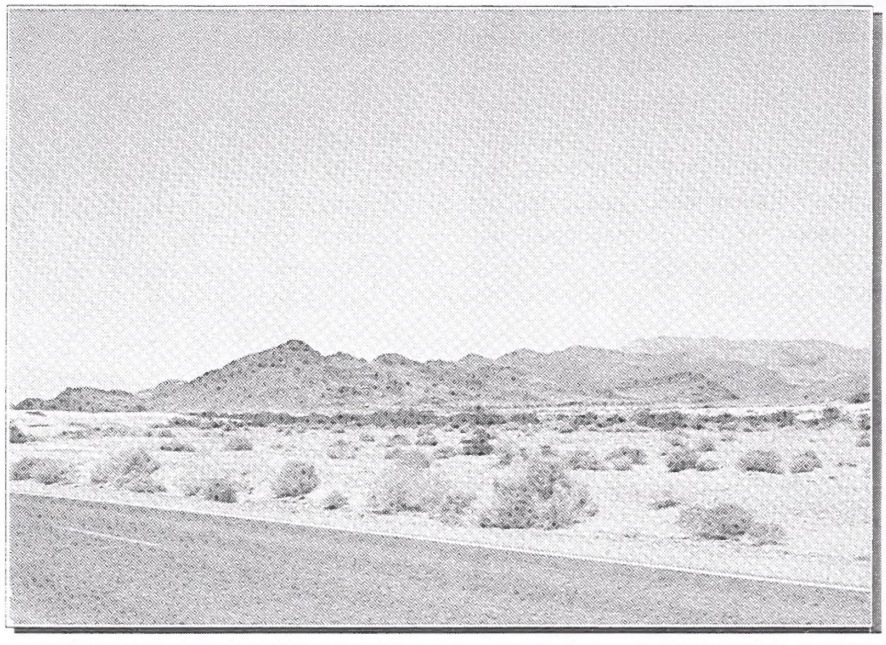
The area has a VRM Class II rating, the highest within the study area.

3.19.2.4 KOP No. 4

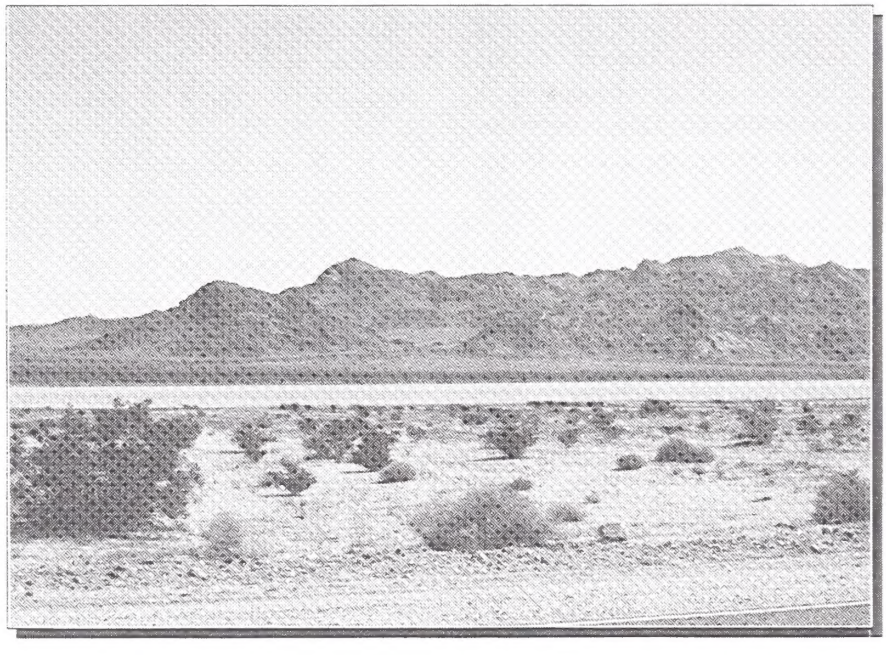
This viewshed is from State Highway 127 in the central portion of the study area looking east across Silurian Lake. The Silurian Hills are in the background. This KOP is shown on Figure 3.19-3b.

KOP No. 4 represents one of the more unique viewsheds looking east from State Highway 127 within the study area. Here, the landscape is broken by the Silurian Dry Lake in the near middleground and the Silurian Hills in the background. Color, texture, and landform include a mix from this KOP. Colors range from light browns to yellow/green to green in the sand and vegetation to the gray/mauve and blue tones in the distant hills. Texture ranges from the smooth finish surface of the dry lake to the spotty desert flat landscape to the jagged nature of the background. The landform includes the contrast of the flat terrain meeting with the sharper hills in the distance.

This view overlaps two VRM class areas. The foreground is a VRM Class II area, while the background is Class III. Scenic quality for both areas is rated as good, and sensitivity levels for both are rated high. The foreground (Class II) area is rated as high sensitivity for foreground views, while the background (Class III) area is rated as high sensitivity for background views.



A. Key Observation Point 3.
View from Highway 127 in north portion of study area looking north toward Salt Creek Spring.



B. Key Observation Point 4.
View from Highway 127 in east-central portion of study area looking east across Silurian Lake with Silurian Hills in background.

KEY OBSERVATION POINTS
Figure 3.19-3

In contrast to this KOP, other viewsheds looking east across the study area include views typical of and similar to those shown on Figure 3.19-4a. This shows the unbroken desert looking northeast from State Highway 127, north of Silurian Lake. The Valjean Valley and Valjean Hills are in the background.

3.19.2.5 KOP No. 5

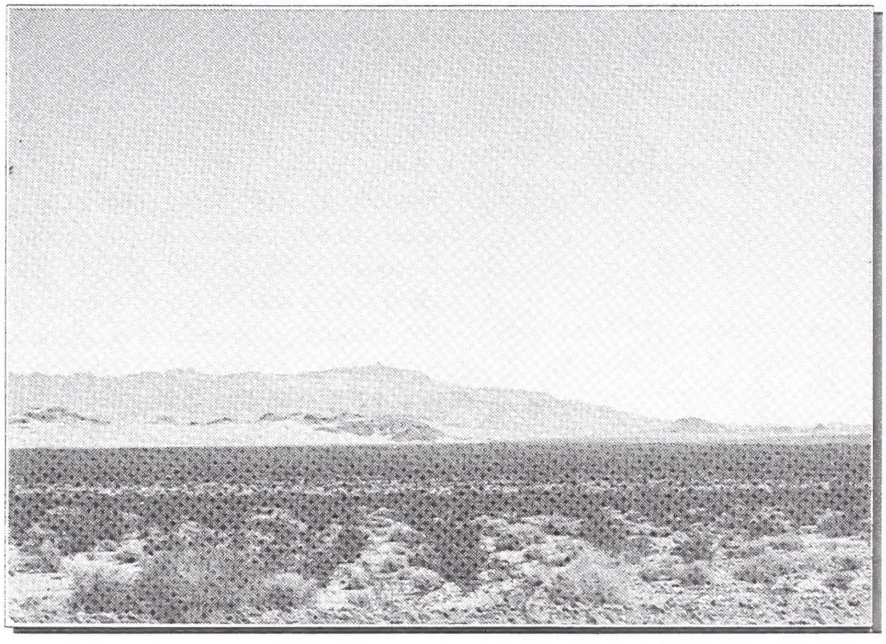
This viewshed is from State Highway 127 from just north of Baker. This is shown on Figure 3.19-4b.

The view of the foreground is typical of the area (spotty vegetation). Color is similar to the above descriptions (i.e., browns with varying shades of spotty green broken by the light brownish desert sand). Distant background hills are muted mauve and gray to blue-gray tones. The large Silver Lake dry lake forms a smoother textured surface in the far middleground to background.

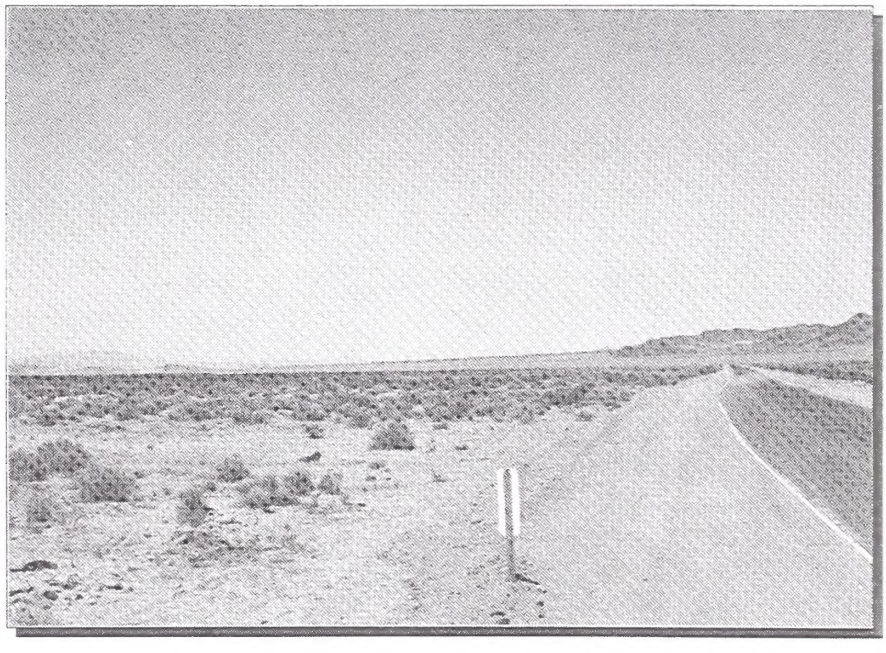
The view looks across a VRM Class III area, which has been given a fair scenic quality rating with a high degree of sensitivity. This high sensitivity level is due to the KOP's proximity to Baker and thus, a greater number of viewers. The high sensitivity level is also directed toward the foreground view, which comprises the greatest majority of the viewshed from this location and is the focus of the viewer's attention.

3.19.2.6 Other KOPs

Other KOPs are located throughout the study area on existing access roads. Additional KOPs from locations adjacent to the study area include approximately 21.5 miles of I-15 between Calico and Cronese Mountains. Foreground views of gently sloping valley areas are also available but limited to approximately a 14-mile stretch of the Coyote Basin and Alvord alternative areas. These same views are available from the railways, although to a lesser degree. Scenic background views of the Alvord and Soda Mountains area are also visible along this route. The foreground terrains throughout this viewing area are generally flat and similar to those shown on Figure 3.19-4b.



A. View looking northeast from Highway 127 at the Valjean Valley and the Valjean Hills.



B. Key Observation Point 5.
View from Highway 127 near Baker looking north.

KEY OBSERVATION POINTS
Figure 3.19-4

3.20 SOLID WASTE AND HAZARDOUS SUBSTANCES

3.20.1 Public and Private Sources and Sites

3.20.1.1 Silurian Valley Area

A Preliminary Assessment Screening (PAS) was conducted of the Silurian Valley portion of the study area as shown on Figure 3.20-1 to determine the extent or potential for hazardous or toxic contamination (Chambers Group 1992a). The intent of the PAS was to assess potential environmental liabilities in accordance with AR 200-1 requirements for a preliminary stage of planning.

The Silurian Valley portion of the study area in the Mojave area physiographic province is deficient in substantial surface water. While no perennial watercourses exist, except for Salt Creek near its confluence with the Amargosa River, four groundwater basins collect stormwater runoff from sheet flow and alluvial washes. Some of these basins receive inflow from the adjoining groundwater basins.

The paucity of available water, coupled with a harsh desert climate, has kept the development of agriculture, housing, industry, and associated environmental problems to a minimum; however, old mines and mining prospect holes are numerous throughout the peripheral mountains of the study area.

To evaluate potential environmental risks within the area of investigation, the following actions were taken in the PAS:

- Topographic maps of the area were studied for sites of potential environmental risks.
- Large-scale aerial photos were studied, and questionable sites were identified on the topographic maps.
- Various governmental agencies with environmental jurisdiction over the area were contacted for knowledge of any problems, corrective actions, or pending litigation. These agencies included
  - SLRWQCB
  - BOM
  - BLM
  - U.S. Army at Fort Irwin
  - EPA
  - California Environmental Protection Agency (Cal-EPA)
  - California Division of Mines and Geology
  - County of San Bernardino
- Sites where environmental hazards might exist were examined by helicopter and ground visits.

The majority of the sites studied were classified into one of four groups, as follows:

1. mine prospect holes,
2. active/abandoned mines,
3. housing areas, and
4. water wells.

The areas of potential environmental concerns were assigned risk categories of Type I, II, or III in accordance with AR 200-1.

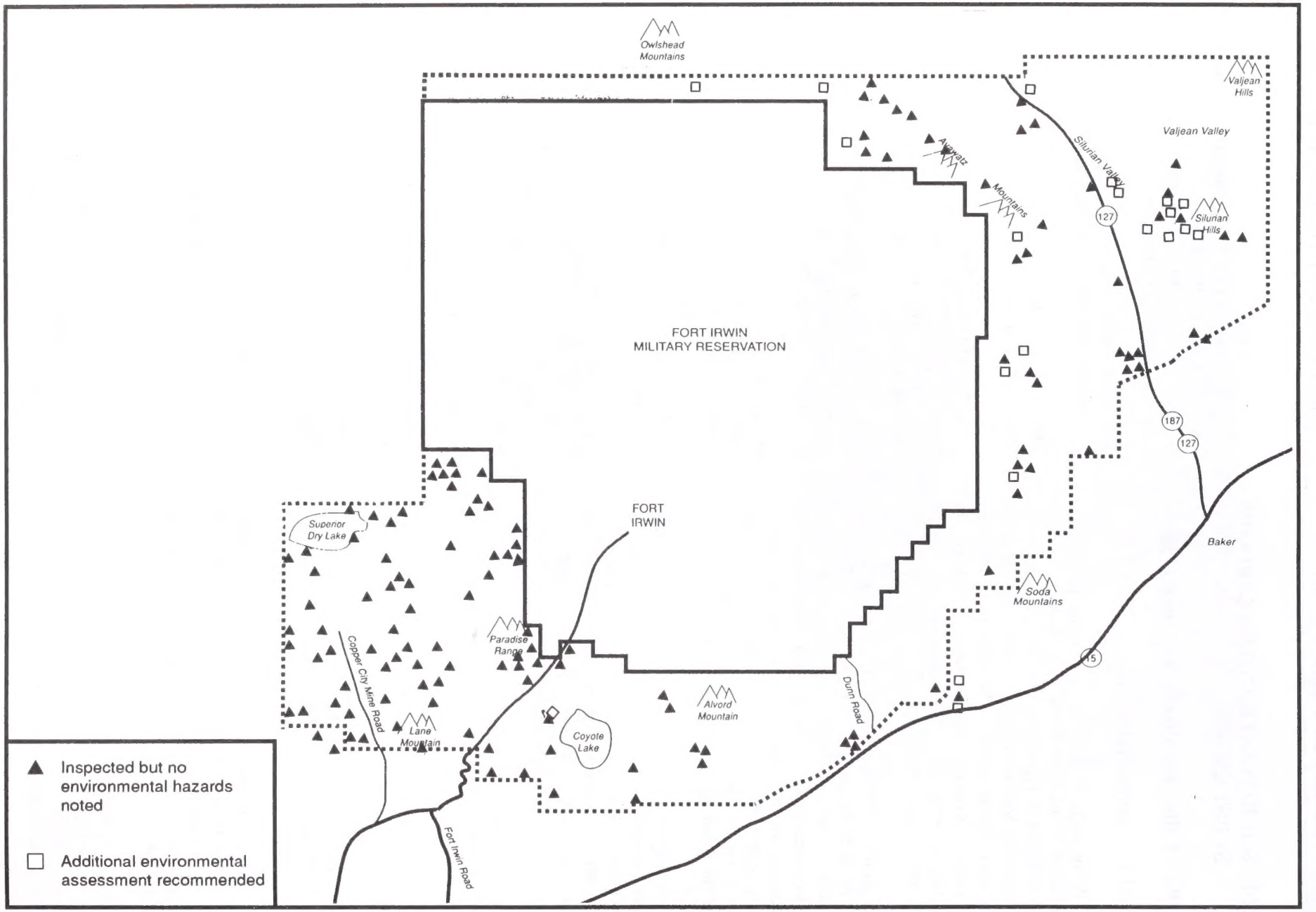
Mining prospect holes were assigned risk category Type I because these areas have never been active mining or processing operations. The only risk posed by these sites is the physical risk of injuries because of people, equipment, or wildlife falling into shafts and excavations.

Some active and abandoned mines were classified Type II risks for potential chemical contamination. In general, most of the mining activities did not use large-scale chemical operations that could contaminate the environment.

Housing areas were assigned risk category Type I or II, depending on the potential for contamination resulting from septic tanks, leach fields, discarded trash, toxic household chemicals, pesticides, and possibly some asbestos. Because housing areas are relatively scarce, no major environmental risks or hazards are expected to result from inclusion in the study area.

Water wells were assigned risk category Type II, even though no current environmental hazard exists. If they remain open, future activities could cause groundwater contamination.

The results of the PAS indicate that no areas of major environmental contamination or hazards exist. However, several areas exist where additional testing was recommended. These are almost exclusively mining areas that should be checked for mineral content in the tailings piles and/or the subsurface soils



AREAS OF POTENTIAL ENVIRONMENTAL CONCERN
Figure 3.20-1

for elevated concentrations of heavy metal contaminates resulting from previous operations. Table 3.20-1 summarizes these areas of potential environmental concern located within the study area, and Figure 3.20-1 shows these locations.

3.20.1.2 Superior Valley East to the Avawatz Mountains

An Environmental Baseline Study (EBS) was conducted of the study area east from Superior Valley to the Avawatz Mountains to determine the extent or potential for hazardous or toxic contamination (Chambers Group 1991b). This EBS was identical in scope and analysis to the aforementioned subsequent PAS done for the Silurian Valley portion of the study area.

The results of the EBS indicate that no areas of major environmental contamination or hazards could be found. However, areas exist where additional environmental investigation was recommended. These are listed in Table 3.20-2 along with the other areas of environmental concern that were investigated. These are almost exclusively mining areas that should be checked for mineral content in the tailings piles and/or the subsurface soils for elevated concentrations of heavy metal and acid leachate contaminates resulting from previous operations.

Acid mine drainage is a problem often associated with working and abandoned mines. In the Mojave Desert area, annual precipitation is probably not sufficient to initiate this process.

Hazardous waste and contamination in the study area could come from a limited number of sources. Local inhabitants are likely to have sewage septic tanks, dumps, and landfills on their property. However, residences are limited in the study area and have minor impacts on environmental quality. No business, commerce, or industrial areas are located on either the public or private lands in the study area.

Silica production involves removing altered rock material and crushing it to a desired size. No hazardous materials are known to be used by operations in the study area.

3.20.1.3 Municipal Landfills

No landfills or dumps are known to exist in the study area (SLRWQCB, personal communication 1988). Local residents may bury, burn, recycle, or transport their waste. The closest municipal landfill is the Fort Irwin Road Land Treatment Site located on Fort Irwin Road near Fossil Bed Road approximately 10 miles north of the study area.

3.20.1.4 Military Sources and Sites

There are no military sources or sites of solid or hazardous waste in the study area.

Table 3.20-1

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED IN THE SILURIAN VALLEY AREA

Quadrangle Name	Map	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Owl Lake	A	A-1	III	Owl Hole Springs - Manganese ore mill site, small oil spills in proximity to spring, distressed vegetation.
East of Owl Lake	B	-	-	No environmental concerns noted in area.
Old Ibex Pass	C	C-1	II	Large metal box located near prospect holes, unknown nature of materials (if any) in box.
	C	C-2	I	Boston Valley Claims - Rock salt deposits, no environmental hazards noted.
	C	C-3	I	King Claims - Rock salt deposits, no environmental hazards noted.
	C	C-4	I	Salt Basin Claims - Rock salt and gypsum deposits, no environmental hazards noted.
Saddle Peak Hills	D	D-1	I	Prospect holes, no environmental hazards noted.
	D	D-2	I	Ruins of old structure, no environmental hazards noted.
	D	D-3	III	Salt Spring Hills - Poisonous gases, potential cyanide or mercury contamination from gold separation techniques.
Dumont Dunes	E	-	-	No environmental concerns noted in area.
Valjean Hills	F	-	-	No environmental concerns noted in area.
Avawatz Pass	G	G-1	II	Denning Springs - Potential cyanide wash tank and smaller vessels containing white powder near old gold mine.
	G	G-2	I	Prospect holes, no environmental hazards noted.
	G	G-3	I	Prospect holes, no environmental hazards noted.
	G	G-4	I	Prospect holes, no environmental hazards noted.
	G	G-5	I	Salt Basin Mines - Mineshafts, no environmental hazards noted.
	G	G-6	I	Prospect holes, no environmental hazards noted.
	G	G-7	I	Cottonwood Spring - Old structure and mineshaft, no environmental hazards noted.
Sheep Creek Spring	H	H-1	I	Sheep Creek Mine - Talc deposits, no environmental hazards noted.
	H	H-2	I	Sheep Creek Spring - University of California reasearch station, scattered refuse, no environmental hazards noted.
	H	H-3	II	Large Ore Stockpile - Uncharacterized stockpile, probably containing ore from Sheep Creek Mine.
	H	H-4	I	Prospect holes, no environmental hazards noted.
	H	H-5	II	Avawatz Crown Mine - Large operation, potential for leachates from lead, zinc, and silver ore.
	H	H-6	I	Prospect holes, no environmental hazards noted.
	H	H-7	I	Prospect holes, no environmental hazards noted.
	H	H-8	I	Old Mormon Springs Ruins - No environmental hazards noted.

KEY: Shaded Area - Additional environmental assessment is recommended.

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Table 3.20-1

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED IN THE SILURIAN VALLEY AREA

Quadrangle Name	Map	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Silurian Lake	I	I-1	I	Ruins of Renoville - No environmental hazards noted.
	I	I-2	II	Williams Well - Dry well and possible ore leaching/wash reservoir.
	I	I-3	I	Mineshaft, prospects, and old ruins - No environmental hazards noted.
Silurian Hills	J	J-1	II	Mineshaft, prospects - Moderate amount of partially buried refuse in wash near mine.
	J	J-2	II	Mineshafts - Large amount of household refuse thrown down vertical shaft, not fully characterized.
	J	J-3	I	Mineshaft and prospect holes - No environmental hazards noted.
	J	J-4	II	Former Riggs Tonopah and Tidewater railroad siding - underground cistern or tank and possible well.
	J	J-5	I	Former Valjean settlement - No environmental hazards noted.
	J	J-6	II	Annex and Berryhill talc and silver mines and residence - uncharacterized tailings potentially containing zinc, lead, and silver, aboveground storage tank at residence.
	J	J-7	I	Prospect holes, no environmental hazards noted.
	J	J-8	II	Mineshafts, prospects, and processing site - Very large reservoir may have been leach tank, 55-gallon drum containig whitish powder.
	J	J-9	II	Riggs Mine - Large operation, tailings may contain leachable lead and silver, abandoned well, former processing area.
	J	J-10	I	Silver Hills Mine #1 - No environmental hazards noted.
	J	J-11	I	Prospect holes, no environmental hazards noted.
Red Pass Lake, NE	K	K-1	I	Small structure near unnamed spring in Avawatz Mountains - No environmental hazards noted.
	K	K-2	I	Mineshafts and prospects - No environmental hazards noted.
Silurian Valley	L	L-1	I	Caltrans road maintenance area - No environmental hazards noted.
	L	L-2	I	Prospect holes, no environmental hazards noted.
	L	L-3	I	Prospect holes, no environmental hazards noted.
	L	L-4	I	Borrow pit - No environmental hazards noted.
	L	L-5	I	Borrow pit - No longer locateable, no environmental hazards noted.
North of Baker	M	M-1	I	Former Tonopah and Tidewater railroad talc siding - No environmental hazards noted.
	M	M-2	I	Mineshaft and prospects - No environmental hazards noted.
	M	M-3	I	Extensive mineshafts and prospect holes - No environmental hazards noted.
Coyote Lake	N	N-1	I	Moderate size gravel pit - Road grader and water truck, no environmental hazards noted.

KEY: Shaded Area - Additional environmental assessment is recommended.

Table 3.20-2

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED FROM SUPERIOR VALLEY EAST TO THE AVAWATZ MOUNTAINS

Quadrangle Name	Figure Number	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Silurian Valley	A-1	-	-	No environmental concerns noted in area.
West of Baker	A-2	1	I	Prospect holes, no environmental hazards noted.
Red Pass Lake NE	A-3	1	I	Prospect holes, no environmental hazards noted.
	A-3	2	II	Iron Mountain Mine - Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-3	3	II	Iron Mountain Mine - Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-3	4	II	Iron King Mine - Now depicted as prospect holes, no environmental hazards noted.
	A-3	5	I	Iron King Mine - Now depicted as prospect holes, no environmental hazards noted.
Red Pass Lake	A-4	1	I	Prospect holes, no environmental hazards noted.
	A-4	2	I	Prospect holes, no environmental hazards noted.
	A-4	3	I	Prospect holes, no environmental hazards noted.
	A-4	4	II	Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings. Open ponds.
	A-4	5	I	Prospect holes, no environmental hazards noted.
Cronese Lakes	A-5	1	I	Prospect holes, no environmental hazards noted.
Cave Mountain	A-6	1	I	Prospect holes, no environmental hazards noted.
	A-6	2	II	Cave Mountain Mine - Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-6	3	I	Prospect holes, no environmental hazards noted.
	A-6	4	II	Undetermined Mine - Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
Bitter Spring	A-7	-	-	No environmental concerns noted in area.
Dunn	A-8	1	I	Prospect holes, no environmental hazards noted.
	A-8	2	II	Open pit mine, small oil spills.
	A-8	3	I	Prospect holes, no environmental hazards noted.
	A-8	4	II	Open pit mine, small oil spills.
	A-8	5	I	Prospect holes, no environmental hazards noted.
East Langford Well	A-9	-	-	No environmental concerns noted in area.
Alvord Mountain East	A-10	-	-	No environmental concerns noted in area.

KEY: Shaded Area - Additional environmental assessment is recommended.

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Table 3.20-2

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED FROM SUPERIOR VALLEY EAST TO THE AVAWATZ MOUNTAINS

Quadrangle Name	Figure Number	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Langford Well	A-11	-	-	No environmental concerns noted in area.
Alvord Mountain West	A-12	1	I	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-12	2	I	Power line ground for major Los Angeles transmission line. Never tested. No environmental concerns noted.
	A-12	3	II	Open pit mine, small oil spills.
	A-12	4	I	Prospect holes, no environmental hazards noted.
	A-12	5	II	Alvord Gold Mine, small oil spills, process chemicals.
	A-12	6	I	Prospect holes, no environmental hazards noted.
	A-12	7	II	Old water well, plugging required.
	A-12	8	II	Old water well, plugging required.
Harvard Hill	A-13	-	-	No environmental concerns noted in area.
East of Goldstone	A-14	1	I	Prospect holes, no environmental hazards noted.
	A-14	2	I	Prospect holes, no environmental hazards noted.
	A-14	3	I	Prospect holes, no environmental hazards noted.
	A-14	4	II	Victor Gold Mine, small oil spills.
Paradise Range	A-15	1	I	Prospect holes, no environmental hazards noted.
	A-15	2	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-15	3	I	Prospect holes, no environmental hazards noted.
	A-15	4	II	Hot springs, potential near surface contamination.
	A-15	5	I	Prospect holes, no environmental hazards noted.
	A-15	6	I	Prospect holes, no environmental hazards noted.
	A-15	7	II	Olympus Gold Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-15	8	I	Prospect holes, no environmental hazards noted.
	A-15	9	I	Radio tower, no known contamination.
	A-15	10	I	Prospect holes, no environmental hazards noted.
	A-15	11	I	Prospect holes, no environmental hazards noted.

KEY: Shaded Area - Additional environmental assessment is recommended.

Table 3.20-2

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED FROM SUPERIOR VALLEY EAST TO THE AVAWATZ MOUNTAINS

Quadrangle Name	Figure Number	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Paradise Range (Continued)	A-15	12	II	Rio Hondo Gold Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-15	13	II	Gold Divide Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-15	14	I	Prospect holes, no environmental hazards noted.
	A-15	15	I	Prospect holes, no environmental hazards noted.
	A-15	16	II	Three Trees Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-15	17	II	Montana Gold Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-15	18	I	Silica Number 1 mine, small oil spills, process chemicals, and unknown minerals in tailings.
Coyote Lake	A-16	1	I	Prospect holes, no environmental hazards noted.
	A-16	2	I	Prospect holes, no environmental hazards noted.
	A-16	3	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-16	4	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-16	5	I	Prospect holes, no environmental hazards noted.
	A-16	6	II	Open sand and gravel pit, small oil spills.
	A-16	7	I	Prospect holes, no environmental hazards noted.
	A-16	8	I	Prospect holes, no environmental hazards noted.
	A-16	9	II	Daisy Gold Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-16	10	II	Nursery, pesticides, fertilizer, miscellaneous trash and refuse.
Yermo	A-17	-	-	No environmental concerns noted in area.
Goldstone	A-18	1	I	Prospect holes, no environmental hazards noted.
	A-18	2	I	Prospect holes, no environmental hazards noted.
	A-18	3	II	Goldstone Gold Mine, small oil spills, process chemicals.
	A-18	4	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-18	5	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-18	6	I	Prospect holes, no environmental hazards noted.
	A-18	7	II	Uncle Sam Gold Mine, small oil spills, process chemicals.
	A-18	8	II	Belmont Gold Mine, small oil spills, process chemicals.
	A-18	9	II	Merrick Gold Mine, small oil spills, process chemicals.

Table 3.20-2

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED FROM SUPERIOR VALLEY EAST TO THE AVAWATZ MOUNTAINS

Quadrangle Name	Figure Number	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Goldstone (Continued)	A-18	10	II	Mancha Gold Mine, small oil spills, process chemicals.
	A-18	11	II	Sky Blue Gold Mine, small oil spills, process chemicals.
	A-18	12	II	Blue Quartz Mine (gemstones), small oil spills.
Williams Well	A-19	1	I	Prospect holes, no environmental hazards noted.
	A-19	2	I	Prospect holes, no environmental hazards noted.
	A-19	3	I	Prospect holes, no environmental hazards noted.
	A-19	4	I	Prospect holes, no environmental hazards noted.
	A-19	5	II	Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-19	6	I	Prospect holes, no environmental hazards noted.
	A-19	7	I	Prospect holes, no environmental hazards noted.
	A-19	8	I	Prospect holes, no environmental hazards noted.
	A-19	9	II	Williams Gold Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-19	10	II	Lanking Strip and building area, septic tanks, small oil spills, household chemicals, general trash.
	A-19	11	I	Prospect holes, no environmental hazards noted.
	A-19	12	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-19	13	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-19	14	II	Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-19	15	II	Azurite mine (copper), small oil spills, process chemicals, and unknown minerals in tailings.
	A-19	16	II	Trade Rat Mine (copper), small oil spills, process chemicals, and unknown minerals in tailings.
	A-19	17	II	Arrastre mine (gold), small oil spills, process chemicals, and unknown minerals in tailings.
	A-19	18	I	Prospect holes, no environmental hazards noted.
	A-19	19	II	Moonlight mine (tungsten), small oil spills, process chemicals, and unknown minerals in tailings.
Lane Mountain	A-20	1	I	Prospect holes, no environmental hazards noted.
	A-20	2	I	Prospect holes, no environmental hazards noted.
	A-20	3	I	Prospect holes, no environmental hazards noted.
	A-20	4	II	Starbright Mine (tungsten and gold), small oil spills, process chemicals, and unknown minerals in tailings.
	A-20	5	I	Prospect holes, no environmental hazards noted.

Table 3.20-2

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN LOCATED FROM SUPERIOR VALLEY EAST TO THE AVAWATZ MOUNTAINS

Quadrangle Name	Figure Number	Index Number	Category AR 200-1	Nature of Area Studied and/or Potential Environmental Problems
Lane Mountain (Continued)	A-20	6	II	Old water well, plugging required.
	A-20	7	I	Radio tower, no known contamination.
	A-20	8	I	Prospect holes, no environmental hazards noted.
	A-20	9	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-20	10	I	Prospect holes, no environmental hazards noted.
	A-20	11	I	Jackass Mine (copper), small oil spills, process chemicals, and unknown minerals in tailings.
	A-20	12	I	Prospect holes, no environmental hazards noted.
Superior Valley	A-21	1	I	Housing area, septic tanks, small oil spills, household chemicals, general trash.
Superior Lake	A-22	1	I	Prospect holes, no environmental hazards noted.
	A-22	2	I	Prospect holes, no environmental hazards noted.
	A-22	3	I	Prospect holes, no environmental hazards noted.
	A-22	4	II	Williams Brothers Pumice Mine, small oil spills.
	A-22	5	II	Housing area, septic tanks, small oil spills, household chemicals, general trash.
	A-22	7	I	Prospect holes, no environmental hazards noted.
	A-22	8	I	Prospect holes, no environmental hazards noted.
	A-22	6	I	Prospect holes, no environmental hazards noted.
	A-22	9	II	Old water well, plugging required.
	A-22	10	II	Old water well, plugging required.
Mud Hills	A-23	1	I	Prospect holes, no environmental hazards noted.
	A-23	2	I	Prospect holes, no environmental hazards noted.
	A-23	3	I	Prospect holes, no environmental hazards noted.
	A-23	4	I	Prospect holes, no environmental hazards noted.
	A-23	5	II	Coolgardie Gold Mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-23	6	I	Prospect holes, no environmental hazards noted.
	A-23	7	II	Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-23	8	II	Open pit mine, small oil spills, process chemicals, and unknown minerals in tailings.
	A-23	9	I	Radio tower, no known contamination.

3.21 HEALTH AND SAFETY

3.21.1 Natural Health and Safety Conditions

Potential health and safety concerns in the study area related to the natural environment include geological, hydrological, and wildfire threats. Because existing natural hazards in the study area have already been described in detail in previous sections of this document, they are only briefly reiterated here.

The study area falls within the area bounded by the San Andreas, Garlock, and Death Valley fault zones. Numerous smaller faults, both active and historically active, traverse the study area. Recent seismic activity associated with the Landers and Big Bear earthquakes in 1992 has shown that the study area falls within a very active seismic zone. The primary geologic risk to human health and safety arises from the site's proximity to the San Andreas fault zone and other active faults. As is the case in most of southern California, seismic shaking associated with a large earthquake along one of these faults could result in injuries or death because of building collapse, falling debris, and other related hazards. In addition, a possibility of vehicular accidents exists during an earthquake event, particularly if the vehicles are operating on steep terrain.

Hydrologic hazards, in the form of flash floods, are a potential threat to human health and safety during and after rainstorms in the desert. Much of the study area is subject to flash flooding following heavy rainstorms. Heavy torrential rains can cause violent flood waves when they are concentrated in canyon areas and slower, less destructive flow when concentrated over open slopes or bajadas.

Wildfires in the study area could present a relatively minor threat to human health and safety. Very few residences occur within the study area; thus, wildfires would only be a threat to these residences if the fires occurred in close proximity to them. Any wildfires occurring in the remote, unpopulated portions of the study area represent minor threats because of the lack of substantial amounts of vegetation that would fuel the fires.

Extended exposure to desert climatic conditions can be hazardous to human health if appropriate precautions are not taken. Typical summer daytime temperatures can reach the low 100s (degrees Fahrenheit). Extended exposure to the sun and heat without the appropriate clothing, shade, and adequate water can result in heat stroke or heat exhaustion. The majority of the study area supports vegetation communities that typically do not provide adequate shade for protection from the sun. The presence of a few springs in the study area could provide water, but the water in most of the springs is not suitable for human consumption.

Other natural health and safety concerns are related to encounters between humans and poisonous reptiles and insects. The study area falls within the range of several species of rattlesnakes, including the Mojave rattlesnake, speckled rattlesnake, and sidewinder. These species have all been observed in the study area. The Mojave rattlesnake is particularly dangerous because of the potency of its venom. Bites from these snakes could potentially cause great harm to humans, particularly if left untreated for an extended period of time. In addition to poisonous reptiles, scorpions and poisonous spiders, such as tarantulas, also pose a threat to human health. A sting or bite from these invertebrates is typically not a serious threat, although those people with sensitivities to the venom of bees and wasps could have potentially serious reactions to the venom of scorpions and tarantulas.

The general remoteness of the study area is a hazard in itself because any human injury or vehicle breakdown is at a risk of nondiscovery. Search and rescue in the study area are currently the responsibility of the San Bernardino County Sheriff.

3.21.2 Manmade Health and Safety Conditions

The 625,920-acre study area is primarily vacant land that has been subjected to various historical and present land uses, including grazing, mining, and recreation. Much of the study area is relatively undisturbed because of the lack of roads and trails and the resulting inaccessibility of many areas. Numerous active and abandoned mines occur within the boundaries of the study area. Many of the abandoned mines are not boarded up or protected from trespassing by humans. The abandoned shafts represent a physical hazard to humans with respect to the risk of falling into the mine. Mining prospect holes, which have never been active mining or processing operations, also pose a physical risk of injuries because of people, equipment, or wildlife falling into the holes. The tailings or mining wastes from some of the active and abandoned mines could pose a health hazard to humans

because of their potential for chemical contamination. In general, most of the mining activities in the study area did not engage in large-scale chemical operations.

Water wells within the study area, which are either idle or abandoned, could pose a potential human health risk because they provide a conduit for downward migration of surficial contaminants into the underlying groundwater system. Some types of wells, particularly those that are uncovered, large diameter, hand-dug, wooden, or cement-cased, may present an additional physical hazard to humans and wildlife because they could inadvertently fall in them and drown.

The few scattered residences within the study area could pose a potential health risk because of contamination resulting from septic tanks, leach fields, discarded trash, toxic household chemicals, pesticides, and possibly some asbestos. Because housing areas are relatively scarce, no major environmental or human health risks would be expected to result from these residences.

Three utility corridors are present within the boundaries of the study area, including the Boulder Utility Corridor (Corridor D), the I-15 Utility Corridor (Corridor BB), and Corridor Q. These corridors contain powerlines, transcontinental fiber-optic cables, and trans-state oil and gas pipelines. The high-voltage transmission lines could pose an electrocution hazard to humans on the ground if seismic events topple the towers; they could also pose a threat to low-flying aircraft. The Kern River Gas Transmission Pipeline, which transports natural gas, is located within Corridors D and Q. Rupture of this natural gas pipeline and potential fire could pose a health risk to personnel maintaining the pipeline or to individuals in the vicinity of a rupture. No human health risk is associated with underground fiber-optic cables.

No known active or former landfills, dumps, or underground storage tanks are within the boundaries of the study area. Based on the past land use of the area and its relatively undisturbed condition, it is unlikely that any significant quantities of potentially hazardous materials or waste are present that could pose a threat to human health.

OHV recreation activities currently occur within various portions of the study area. A risk of vehicle accidents exists along with a potential for resulting injuries to humans. No designated OHV areas are located within the boundaries of the study area, but evidence exists throughout much of the area that OHVs do go off-road. Traffic accidents, particularly along Fort Irwin Road and State Highway 127, also pose a health and safety risk to humans. The presence of windblown dust during heavy windstorms could serve to increase the risk of traffic accidents along these two roads.

SECTION 4 - ENVIRONMENTAL IMPACT ANALYSIS

4.1 INTRODUCTION

4.1.1 Scope and Organization of Analysis

Section 4 is a detailed analysis of the environmental impacts associated with the proposed land acquisition by the NTC. The analysis addresses the Proposed Action (Silurian Valley) described in Section 2.3 of this document. Additionally, impacts of other alternatives, including the No Action Alternative, described in Section 2.4 are analyzed on a coequal basis. The impacts of the actual acquisition, training activities, and any construction associated with the alternatives are identified.

The impact analysis is divided into the various environmental discipline area, and each alternative is analyzed within each discipline area. Section 4.22 provides a summary of all impacts associated with each alternative analyzed in detail.

In addition to the impact analysis for each alternative, mitigation measures and a cumulative impact analysis are also presented. Section 4.22 also provides a summary of all impacts remaining after mitigation and a summary of cumulative impacts associated with each alternative analyzed in detail.

4.1.2 Discussion of Impacting Factors and Other Assumptions Used for Impact Analysis

In the analysis of the No Action alternative, it is assumed the land that could be potentially acquired under the Proposed Action or other alternatives would remain in its current ownership. It is further assumed that the lands within the study area would continue to be managed and used according to the current land use plans and designations of federal, state, and local agencies. For purposes of analyzing the No Action Alternative impacts, the entire study area is considered rather than the particular area covered by the Proposed Action or any of the other alternatives. This does not substantially affect the results of the analysis.

In all other alternatives, impacting factors can be divided into three categories: (1) impacts associated with acquisition itself, (2) impacts associated with training activities, and (3) impacts associated with construction. Impacting factors associated with each of these categories are described below.

Impacts associated with the actual acquisition of new training lands are primarily those of land use and access. Use of the area for military purposes will override current uses that are allowed by the BLM, State of California, or the County of San Bernardino. Public access will be denied in the acquired land, and uses such as grazing and mineral exploration would be curtailed, although the NTC proposal is to allow currently active mines to continue in operation.

Most physical impacts associated with the Proposed Action and alternatives will be associated with the training activities on the acquired lands. The acquired lands will be used for support bases. Soil and vegetation will be disturbed due to intensive use of tracked and wheeled vehicles, landing pads and similar facilities, and trenching for tank and gun emplacement. It is anticipated that the majority of impacts will be within those areas of 20 percent or less slope because most tanks normally operate within these lesser stepped areas. The remainder of the areas would be less impacted by foot patrols and similar exercises.

Training may also create additional impacts that affect both the acquisition lands and surrounding areas, including powerlines and other facilities within areas proposed for acquisition.

Because the anticipated uses of the proposed acquisition lands will be for training of units simulating real battlefield conditions, construction will be quite limited. The major construction associated with the Proposed Action will be building up to six undercrossings to allow units to cross Highway 127. No utilities or similar facilities are proposed because units must operate under self-contained conditions.

4.1.3 Cumulative Impact Analysis and Projects Assumed in Cumulative Impact Baseline

In addition to the direct and indirect impacts associated with implementation of the Proposed Action and alternatives, NEPA requires that cumulative impacts be addressed. A cumulative impact is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Projects considered in this analysis are described below. These include large regional actions and/or plans and local major projects. Local major projects are shown on Figure 4.1-1. Numbers following project titles correlate with project numbers on Figure 4.1-1.

4.1.3.1 Regional Planning Efforts

West Mojave Coordinated Management Plan

The West Mojave Coordinated Management Plan (WMCMP), a proposed plan amendment to the CDCA Plan, is currently under development. When completed, it is intended to provide for continued use and development within a 9.4-million-acre area of the western Mojave Desert region of southern California in a manner that will ensure conservation of listed plant and animal species and minimize impacts on critical portions of their supporting habitats. Two species that are especially targeted for management protection by this plan are the desert tortoise (*Gopherus agassizii*) and the Mohave ground squirrel (*Spermophilus mojavensis*) in the western Mojave region of southern California. The proposed WMCMP is a multiagency planning effort involving the BLM, USFWS, CDFG, and local governments.

The WMCMP management goals are to (1) provide recovery of federal- and state-listed plant and animal species as viable wild populations, (2) conserve critical elements of supporting habitats, (3) allow resource use and community expansion, and (4) simplify and reduce the regulatory burden of permitting processes for projects on public and private lands.

The planning area involves approximately 9.4 million acres of federal, state, and private lands within the western portion of the Mojave Desert. The area extends from Olancha on the north to the San Gabriel and San Bernardino Mountains on the south and from Antelope Valley on the west to Twentynine Palms on the east. Approximately 340,000 acres of the NTC expansion proposal study area lie within the WMCMP planning area.

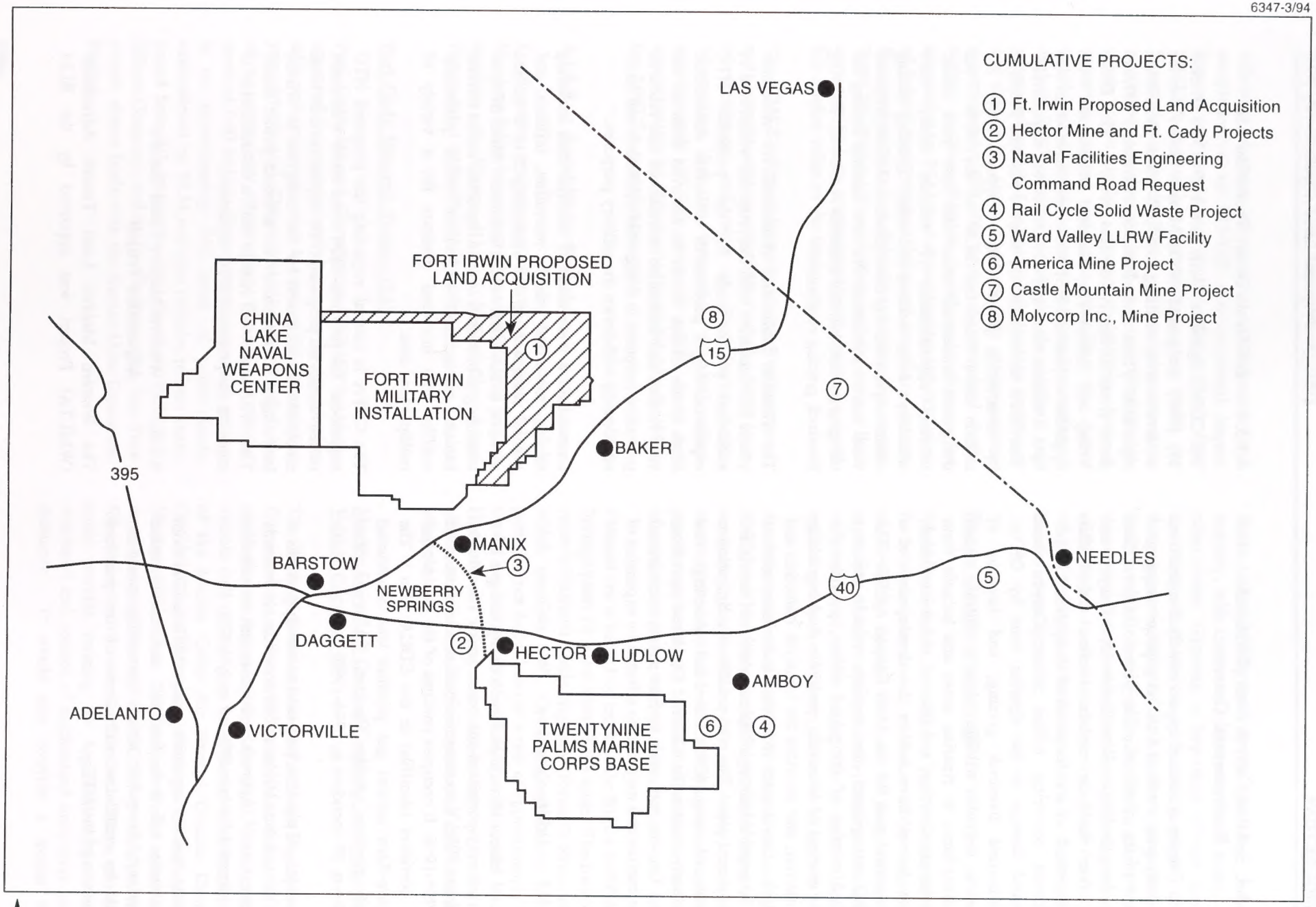
The WMCMP is still in the preliminary draft stage, and many details of the proposed or preferred amendments to the CDCA Plan are not yet available.

4.1.3.2 Northern and Eastern Mojave Coordinated Management Plan

The Northern and Eastern Mojave Management Plan (NEMP) includes all of the expanded Death Valley National Park (3.3 million acres), the Mojave National Preserve (1.4 million acres) and approximately 2.4 million acres of BLM lands between and around these two National Park units. There are about 700,000 acres of state, local and private lands in the plan area; however, these lands are not being planned for in this effort. All the lands are in California except for the "Nevada triangle" of Death Valley.

4.1.3.3 Community Annexations and Development

The communities of Victorville, Adelanto, Apple Valley, and Hesperia underwent several spurts of rapid growth, the most recent in 1990-1991. With population increases and business development, these communities are analyzing the areas in the desert that may logically be added to their respective spheres of influence and future corporate/municipal limits. These types of community planning are important to set and apply methodologies for providing infrastructure to rapid growth areas. While community planning may control some types of growth in the region, it may also encourage additional growth and development. Increased populations may seek to limit the areas near them for uses by military, mining, and utilities, as well as larger or additional areas for recreation. The cities of Victorville, Adelanto, Barstow, and Apple Valley have specific proposals of record for expansion of spheres of influence. Their proximity to the NTC may add to the cumulative impacts of the expansion proposal on the desert ecosystem and uses.



CUMULATIVE PROJECTS IN GREATER PROJECT AREA
Figure 4.1-1

4.1.3.4 Afton Canyon Area of Critical Environmental Concern

Afton Canyon is located approximately 5 miles from the study area, south of I-15. A popular campground is part of the facilities. The historic Mojave Road runs along the Mojave River inside Afton Canyon, and the river itself is on the surface rather than underground, as it is for much of its upstream length. Problems occurring within Afton Canyon have included damage to the riparian zone by OHVs, unauthorized livestock grazing, and invasion of tamarisk; degraded wildlife habitat conditions caused by disturbance to riparian zones and hazards from recreational shooting; and reduced visual conditions. These factors have led to the development of a management plan for the Afton Canyon ACEC. The ACEC management plan confines vehicle use to a limited number of designated routes, provides for better control of livestock, prohibits shooting within the canyon, and provides for tamarisk reduction and control. Low-impact recreation and visitor services will be provided through implementation of the ACEC management plan. The plan constitutes a limitation to recreational uses (OHV use and shooting) that previously occurred in the area. Displaced users from Afton Canyon may seek to find nearby recreational opportunities that may also be affected by expansion of the NTC.

4.1.3.5 Utility Corridors

Several transmission lines for electricity and gas have been recently permitted and constructed. The Meade-Adelanto 500-kV ac transmission line was constructed in 1995-1996. It occupies portions of the Boulder and "Q" corridors identified in the CDCA Plan. The Mojave-Kern natural gas pipeline was constructed within portions of the Boulder, I-15, and State Highway 58 corridors in 1994-1995.

The Cajon oil pipeline, proposed to occupy portions of the "Q" and State Highway 395 corridors, is presently being evaluated. Approval and subsequent construction are estimated for late 1996 or early 1997.

Impacts on soil, vegetation, and wildlife habitat from construction of these facilities, and the increased opportunity for public access onto utility corridors, would be cumulative with those of the proposed expansion of the NTC.

4.1.3.6 California Desert Protection Act

The CDPA, signed as Public Law 103-433 on October 31, 1994, designated 69 BLM and Forest Service wilderness areas totalling 3,667,020 acres, established eight BLM WSAs, and released approximately 900,000 acres from further wilderness review. The Death Valley and Joshua Tree National Monuments were upgraded to National Park status and increased in size by 1.3 million acres and 234,000 acres, respectively. The CDPA also created the Mojave National Preserve by transferring jurisdiction of approximately 1.3 million acres from the BLM to the NPS. All designated wilderness areas and new park lands, totalling approximately 7 million acres, were withdrawn from location and entry. Existing mining claims require validity determinations before proposed work can be conducted. No new mineral leasing for oil, gas, geothermal, and minerals is allowed. Existing livestock grazing continues.

The effects of public land withdrawals for wilderness would be cumulative with the proposed withdrawal of additional public lands by the proposed NTC expansion. Major portions of accessible mineralized lands in the CDCA would be removed from all but very limited and controlled recreational and resource protection purposes in designated wilderness and lands additionally withdrawn for military purposes.

Demand for a wide range of multiple uses including mining, motorized vehicle recreation, utilities, and general recreation on the remaining 2 to 3 million acres of public lands would increase. Most of these remaining public lands contain important desert tortoise habitat, management of which would potentially conflict with increased pressure for a variety of multiple land uses.

The CDPA is neutral regarding the proposed NTC expansion. The previous BLM areas under wilderness review within the proposed NTC expansion area were modified and designated by the congress as WSAs, including a withdrawal of the affected public lands. The WSA status will remain until a determination is made on the proposed NTC expansion.

4.1.3.7 Western Mojave Land Tenure Adjustment Project

The Western Mojave Land Tenure Adjustment (WMLTA) Project was approved by the BLM

following 6 years of project development and completion of an EIS/EIR (Environmental Impact Report) and amendment to the CDCA Plan. The WMLTA Project is a partnership among BLM, the Department of the Air Force, and local governments to implement a voluntary land exchange program to create more logical ownership patterns, protect important natural resources including the desert tortoise and its habitat, ensure continuing protection of critical DOD airspace assets in the region, and promote disposal of isolated public lands in developed and developing areas. Over the life of the project, approximately 255,000 acres of nonfederal lands within a "consolidation zone" are planned for acquisition by BLM, and approximately 105,000 acres of federal lands within a "disposal zone" are planned for conveyance out of federal ownership. Under the WMLTA Project, all acquisitions and disposals of land are completed on a voluntary basis and at appraised fair market value of the lands.

The WMLTA Project area contains 2.8 million acres and abuts the western edge of the existing NTC south of Goldstone and west of Fort Irwin Road. Alternatives for the expansion proposal affect approximately 95,000 acres of public lands and approximately 35,000 acres of nonfederal lands within the WMLTA consolidation zone.

4.1.3.8 Local Major Projects

Local major projects are shown on Figure 4.1-1. Numbers following project titles correlate with project numbers on Figure 4.1-1. Project No. 1 on Figure 4.1-1 is the Proposed Action.

Fort Cady Minerals Project (2A)

Fort Cady Mineral Corporation (FCMC) has been approved to construct and operate an in-situ solution mine and processing plant to produce 90,000 tons per year of boric acid. The project is located 17 miles east of the community of Newberry Springs and 1 mile south of I-40 and the Hector interchange. The project is on approximately 340 acres of public lands administered by BLM and also includes private lands leased from NL Industries, Inc., Southern California Edison Company, and SF Pacific Properties, Inc. This project shares lands with the Hector Mine Expansion Project.

Boric acid is widely used in the glass and ceramic industry, with some uses in fire retardants, soaps, and other areas. Gypsum, a byproduct of the mining operation, would also be produced. The project could comprise up to 250 solution wells, a 6-acre processing facility, and a 16-acre gypsum deposition area. Process water would be recovered from an aquifer located west of the Pisgah Fault. Materials transport for the facility via the Burlington Northern and Santa Fe Railway line has also been approved.

Hector Mine Expansion (2B)

NL Industries, Inc., now Rheox Inc., has been mining for hectorite in an area 16 miles east of the community of Newberry Springs for over 50 years. Rheox is expanding its active open pit and overburden stockpiles on private and public lands. The project is located approximately 1 mile south of Hector along I-40.

A total expansion of about 175 acres is occurring in four phases that began in 1990. Mining is expected to continue through 2031 with completion, including reclamation, expected in 2035. Mining operations will produce approximately 550,000 bank cubic yards (bcy) of overburden on an average annual basis.

Cleaned ore is hauled by truck to the Rheox Newberry Springs plant 16 miles west of the mine. The trucking route is National Trails Highway (formally Route 66), which parallels I-40. Ore shipments occur on a periodic (not daily) basis at a rate of approximately 24 trucks at one time to Newberry and 24 trucks to the Hector rail siding for direct shipment. Future shipments are expected to continue on this irregular schedule.

Marine Corps Air Ground Combat Center Tactical Vehicle Corridor (3)

The Western Division, Naval Facilities Engineering Command out of San Bruno, California, submitted an application in August 1990 to the BLM for a tactical vehicle trail right-of-way from the northern boundary of the Marine Corps Air Ground Combat Center (MCAGCC) in Twentynine Palms to the railhead at Manix, California. The project would meet the mission requirement of MCAGCC to provide practice for administrative vehicular marches. These marches could provide training for logistical support and command and control of mechanized units over long distances. It would also provide a means for

wide, and ungraded except where necessary to prevent offsite erosion or generation of dust. Two 20-acre staging areas would be placed along this length as well. The right-of-way is proposed for intermittent year-round use. Use would range from individual tactical vehicle "sorties" to several hundred tracked and wheeled tactical vehicles using the roadway on a daily basis for 10 to 14 days, about four to five times per year.

The MCAGCC application has been inactive for the last few years, and it is unknown at this time if the proposal will go forward into the environmental review stage.

Rail Cycle Solid Waste Disposal Project (4)

The Rail Cycle Project, a combined effort of Waste Management of North America, Inc., and the Burlington Northern and Santa Fe Railway Company, is proposed as a "Class III" landfill that would handle 21,000 tons per day of solid waste for 60 to 100 years (a total of 400 to 500 million tons). The project is proposed to be located approximately halfway between Barstow and Needles and 3 miles south of the Burlington Northern Santa Fe rail line. The proposed site consists of 4,800 acres near Bristol Dry Lake near Amboy. Approximately 2,100 acres would be used for landfilling, while the remainder would be used as buffer zone and support areas. An EIS/EIR is in preparation.

The project as proposed would also establish and own materials recovery facilities in strategic areas throughout the Counties of Los Angeles, Orange, San Diego, and San Bernardino. These facilities would be located along existing rail lines within a 20-mile hauling radius for local waste truck haulers. At these facilities, waste would be screened for hazardous materials and recyclables. Acceptable solid waste would be compacted, loaded into steel intermodal containers, and transported by rail to the landfill.

During initial startup, two trains per day would run on existing rail lines. Within a 7-year period after initial startup, it is estimated that seven trains per day, each pulling 100 cars (50 double-stacked intermodal containers) would deliver waste to the site. Trains would run to the site at night and return to the greater Los Angeles area the next morning for the next day's load.

The future development of the Rail Cycle Project is not clear at this time. The uncertainty results from the failure of ballot measures in March 1996 that would allow the County of San Bernardino to tax the facility. However, the project will be considered in the cumulative impact analysis.

Ward Valley Low Level Radioactive Waste Disposal Site (5)

The Ward Valley Project near the California-Nevada Border is for storage of subsurface-level radioactive waste. This is currently under consideration by the State of California.

Under the Low-Level Radioactive Waste (LLRW) Policy Act of 1980, the state is responsible for licensing a private company to develop and operate the facility. U.S. Ecology, Inc., as license-designee, is proposing an LLRW facility at Ward Valley. The Project is approximately 24 miles west of Ward Valley in San Bernardino County and about 1 mile south of I-40.

The site is on federal land managed by the BLM and comprises about 1,000 acres. The project itself would consist of a 90-acre disposal and support facilities area, roadway, and utility corridor. The remainder of the area is intended as a buffer zone. As part of the action, property ownership would be transferred from the Federal Government to the State of California.

The proposed project would provide for the permanent disposal of LLRW (Class A, B, and C), a state responsibility under Public Law 99-240. These wastes include radionuclides with short half-lives. These wastes would be disposed of in containers placed within trenches and covered with soil. No hazardous wastes, hazardous LLRW, high-level radioactive wastes, or nuclear weapons-related wastes would be accepted. It is expected that the project would receive LLRW generated from four states for a period of 30 years, after which the site would close. After closure, the State of California would maintain the site for a period of 100 years. A final EIR/EIS has been prepared for this project (Dames & Moore 1991).

Because of this proposed facility's location near Needles, it is expected that construction workers and some supplies and equipment would come from Needles. During operations, the number of LLRW

truck shipments coming through Barstow would average about 13 trips (26 round trips) per week.

American Mine Project (6)

The Palms Mining Company has submitted an application for a conditional use permit and reclamation plan to establish an open pit gold mining operation using cyanide heap leach processing methods. The total acreage for the project is 1,355 acres. The mine would be located about 10 miles south of Amboy, nearly adjacent to the Twentynine Palms Marine Base.

The mine would be designed to process 2 million tons of ore annually and operate for up to 15 years, including final reclamation activities. The project would employ approximately 100 persons during operation.

The mine would include two primary mine pit areas with four or more individual pits, two waste rock disposal areas, a heap leach pad, solution storage area, and a gold extraction plant. Support facilities would include ore crushing and transport facilities, solution conveyance pipes, access roads, utilities, and mine shop and maintenance structures.

Other Projects Located Off Interstate 15 (8)(9)

Two additional projects have been proposed to be located between Baker and the California-Nevada border off I-15. One is the Castle Mountain Mine Project, a proposed open pit, heap leach gold mine on 115 acres and reclamation on 2,735 acres, located approximately 100 miles east of Barstow, approximately 15 miles south of I-15, and 4 miles west of the Nevada state line. The project has been approved. The second project is a proposal for a rare earth minerals mine, referred to as the MolyCorp Mine, which would be located approximately 35 miles northeast of Baker.

Support facilities and employees for both operations would generally come from the Las Vegas and Needles areas.

4.2 GEOLOGY

Implementation of the Proposed Action and alternatives will have minor effects related to geologic factors because only limited construction will occur.

Geologic impacts were considered potentially significant if:

- a geologic feature of unusual scientific value for study or interpretation would be disturbed,
- geologic processes that would threaten human life or property (such as landsliding or erosion) would be triggered or accelerated, and/or
- substantial alteration of topography would occur.

Seismicity impacts were considered significant if earthquake-induced ground shaking could lead to substantial damage to proposed structures, injury, or loss of life.

4.2.1 Proposed Action

4.2.1.1 Impacts

No unusual geologic features of scientific value for study or interpretation would be disturbed, and no significant alteration of topography would occur as a result of the Proposed Action. Landslides could be triggered, and increased rates of erosion could result from heavy equipment movement, but because no habitable structures will be built, the risk to human life and property from landslide hazards is considered remote.

Substantial alteration of topography is not expected to occur under any of the alternatives presented herein. Under various combat scenarios, trenches for "hull-down" protection of armored vehicles, antitank ditches, slit trenches, foxholes, and so forth may be excavated in nonsensitive areas. At the end of each rotation, excavations will be filled and the ground surface will be restored. These minor surface disturbances will result in less than significant topographic impacts, primarily to the alluviated valley floors, within the 277,244-acre net maneuverable area.

Like most of the southern California, the Proposed Action area is potentially subject to earthquakes, which could result in severe ground shaking and surface ruptures in some areas. However, the only structures that will be built under the Proposed Action are four microwave support towers and the undercrossings along State Highway 127 to accommodate movement of tracked vehicles. Given that all of these structures will be built using appropriate seismic engineering designs, the likelihood that a seismic event would result in substantial structural damage or injury to personnel is considered remote. Therefore, seismicity impacts are considered less than significant.

4.2.1.2 Mitigation

Based on the three identified criteria, none of the anticipated impacts related to geologic resources and hazards will be significant, and no mitigations are required. The Proposed Action will result in minor surface disturbance and alteration of topography, and project design includes filling excavations at the end of each rotation. Potential impacts on the proposed structures will be minimized through appropriate seismic engineering design.

4.2.2 Modified Avawatz-Silurian Alternative

4.2.2.1 Impacts

Implementation of the Modified Avawatz-Silurian Alternative would result in impacts on the geological environment due to less than significant land form alterations similar to those described for the Proposed Action (Section 4.2.1.1) within the 226,793-acre net maneuverable area. Impacts associated with heavy equipment movement and temporary excavations during hull-down procedures would be reduced over the Proposed Action because the Salt Creek ACEC and 4 square miles around the Silurian Hills would be excluded from the project area.

4.2.2.2 Mitigation

The anticipated impacts on geologic resources and those due to seismicity associated with the Modified Avawatz-Silurian Alternative would be minor and not significant; therefore, no mitigations are required.

4.2.3 Modified Coyote Basin Alternative

4.2.3.1 Impacts

Implementation of the Modified Coyote Basin Alternative would result in impacts on the geological environment due to small land form alterations similar to those described for the Proposed Action (Section 4.2.1.1) within the 236,175-acre net maneuverable area. Due to the remote locations of the microwave support towers, there would be a very low risk of injury or loss of human life from a tower collapse as a result of seismic shaking.

4.2.3.2 Mitigation

Impacts on geologic resources and potential impacts of geologic hazards associated with this alternative are considered minor; therefore, no mitigations for geologic impacts would be required.

4.2.4 Alvord Alternative

4.2.4.1 Impacts

Implementation of the Alvord Alternative would result in impacts similar to those described for the Modified Coyote Basin Alternative (Section 4.2.3.1) within the 190,727-acre net maneuverable area.

4.2.4.2 Mitigation

Impacts on geologic resources and potential impacts of geologic hazards associated with this alternative are considered minor; therefore, no mitigations for geologic impacts would be required.

4.2.5 Superior Valley Alternative

4.2.5.1 Impacts

Implementation of the Superior Valley Alternative would result in impacts similar to those described for the Modified Coyote Basin Alternative (Section 4.2.3.1) within the 264,776-acre net maneuverable area.

4.2.5.2 Mitigation

Impacts on geologic resources and potential impacts of geologic hazards associated with this alternative are considered minor; therefore, no mitigations for geologic impacts would be required.

4.2.6 Avawatz Alternative

4.2.6.1 Impacts

Implementation of the Avawatz Alternative would result in impacts similar to those described for the Modified Coyote Basin Alternative (Section 4.2.3.1) within the 170,401-acre net maneuverable area.

4.2.6.2 Mitigation

Impacts on geologic resources and potential impacts of geologic hazards associated with this alternative are considered minor; therefore, no mitigations for geologic impacts would be required.

4.2.7 No Action Alternative

No impacts on the geologic environment would be expected to occur with the No Action Alternative. Like most of the southern California region, the existing facilities at NTC, as well as the surrounding study area, are subject to potentially severe earthquakes. The potential for injury to humans and property damage within the study area (outside of the existing Fort Irwin boundaries) is minimal because of the extremely low population density and lack of structures. This potential would be unaffected by implementation of the Proposed Action. No other proposals involving substantial alteration of topography exist within any of the alternative acquisition areas.

4.2.8 Cumulative Impacts

The general seismic environment in and around the study area has been of concern because of recent seismic activity. As additional development and structures are placed within the area, the overall impact of a seismic event would be increased because more structures would potentially be subjected to severe seismic shaking and collapse. If a large earthquake were to occur in the area, damage to the

undercrossings constructed under the Proposed Action would contribute to the cumulative impact on structures in the region. This increased risk to structures is not considered significant because the structures planned for the acquisition area are the undercrossings which will be designed according to best and most recent engineering practices for seismic design.

4.2.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.2-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.2-2.

Table 4.2-1

GEOLOGY - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz	No Action
Landform/ Topography	No significant impacts.	No significant impacts.	No significant impacts.	No significant impacts.	No significant impacts.	No significant impacts.	No impact.

Table 4.2-2

GEOLOGY - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Landform/ Topography	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.

4.3 SOILS

The following criteria were used to assess significance for soil impacts:

- A significant impact will occur to soils if an irreversible disruption of a contiguous 640-acre, or larger, area of soil crust or a similar acreage of desert soils could not be rehabilitated within 10 years.

- A significant impact will occur to dry lakebeds or playa deposits if vehicular or other direct mechanical apparatus disturbs the upper dried clayey surface crust and exposes underlying fine sediment to wind erosion.

4.3.1 Proposed Action

4.3.1.1 Impacts

Areas of 20-percent slope or less (277,244 acres) would receive the heaviest vehicle use. Tracked vehicle use in these areas would result in crushing naturally occurring rock exposures and disturbing "desert pavement." Ridges, hills, outwash plains, and alluvial surfaces would also be impacted by operation of tracked vehicles and rendered vulnerable to erosion. Areas with slopes greater than 20 percent (53,973 acres) would only be accessed by existing roads.

Tanks and other tracked vehicles normally do not operate on dry lakebeds, which are designated as hazards during military training exercises, to avoid unnecessary damage to equipment and playa surfaces. A low potential for disturbance to dry lakebeds exists if equipment operators become disoriented and stray onto the lakebed surfaces. Minor changes at lakebed edges may occur if machinery frequently disturbs these areas. These changes may result in marginal increases in sediment load in the lakebeds and outwash plains. Dry lakebeds comprise approximately 2,470 acres in the Proposed Action.

Soils most likely to be affected by armored vehicle maneuvers are those in relatively flat areas and areas of gentle topography. These areas generally contain well-developed soils of moderate thickness and varied particle size. Soils most susceptible to compaction are those with higher percentages of clay. Soil compaction would affect the upper 18 inches of soil (Prose 1985), rendering the soils less suitable for revegetation.

Soils in low-lying areas are likely to be permanently altered by ongoing military operation for each of the alternatives under consideration. The soil crust would be broken by tanks and tracked vehicles, and the protective vegetative cover would be trampled. Affected areas would be more vulnerable to erosion by wind and overland flow. Washboard or rutted surfaces could develop in heavily used areas, and erosion could expose underlying hardpan layers.

In summary, implementation of the Proposed Action would result in significant impacts on the soils due to crushing of rock outcrops, disturbance of desert pavement, compaction of upper soil layers, and wind and water erosion in an area of up to 277,244 acres, or substantially greater than the 640-acre significance criterion.

4.3.1.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of funding:

1. Lakebeds in the acquisition area shall be marked off limits on training maps. The lakebed areas shall be marked as hazards during exercises.

Because no known means exist of mitigating surface soil disturbance and the associated erosion generated by military equipment in the desert environment or controlling sand dune generation where desert soils have been disturbed, the project would result in unavoidable significant soil impacts.

4.3.2 Modified Avawatz-Silurian Basin Alternative

4.3.2.1 Impacts

Approximately 43,237 acres of land within the Modified Silurian-Avawatz Alternative consist of slopes greater than 20 percent. The soils in these areas may be impacted, but not as severely as those soils on slopes of less than 20 percent. The area of greatest impact (area with slopes of less than 20 percent) would consist of approximately 226,793 acres. Potential impacts on dry lakebeds would be as described under the Proposed Action.

Sand dune generation is likely to occur south of Alvord Mountain because of transport and deposition

of surface soils during dust storms. Operations southwest of the Soda Mountains would contribute to the existing sand dune formation adjacent to both the East and West Cronese Lakes. This alternative may also result in minor increases in the sediment load into Cronese Lake and/or the Mojave River.

In summary, implementation of the Modified Avawatz-Silurian Basin Alternative would result in significant impacts on the soils due to crushing of rock outcrops, disturbance of desert pavement, compaction of upper soil layers, and wind and water erosion in an area of up to 226,793 acres. This is substantially greater than the 640 acres of desert soils significance criterion and approximately 50,451 acres less than the Proposed Action.

4.3.2.2 Mitigation

The mitigations incorporated into this alternative for reducing impacts on dry lakebeds are the same as those mentioned in Section 4.3.1.2 for the Proposed Action. Because there are no means of mitigating surface soil disturbance and the associated erosion generated by military equipment in the desert environment or controlling sand dune formation where desert soils have been disturbed, residual impacts on soils would be significant.

4.3.3 Modified Coyote Basin Alternative

4.3.3.1 Impacts

Approximately 23,295 acres of land within the Modified Coyote Basin Alternative consist of slopes greater than 20 percent. The soils in these areas may be impacted but not as severely as those soils on slopes of less than 20 percent. The area of greatest impact would consist of approximately 236,175 acres.

Sand dune generation is likely to occur south of Alvord Mountain because of transport and deposition of surface soils during dust storms. Operations southwest of the Soda Mountains would contribute to the existing sand dune formation adjacent to both the East and West Cronese Lakes. This alternative may also result in minor increases in the sediment load into Cronese Lake and/or the Mojave River.

In summary, implementation of the Modified Coyote Basin Alternative would result in significant impacts on the soils due to crushing of rock outcrops, disturbance of desert pavement, compaction of upper soil layers, and wind and water erosion in an area of up to 236,175 acres. This is substantially greater than the 640 acres of desert soils significance criterion and approximately 41,069 acres less than the Proposed Action.

4.3.3.2 Mitigation

The mitigations incorporated into this alternative for reducing impacts on dry lakebeds are the same as those mentioned in Section 4.3.1.2 for the Proposed Action. Because there are no known means of mitigating surface soil disturbance and the associated erosion generated by military equipment in the desert environment or controlling sand dune formation where desert soils have been disturbed.

4.3.4 Alvord Alternative

4.3.4.1 Impacts

Approximately 20,073 acres of land within the Alvord Alternative consist of slopes greater than 20 percent. There may be some impacts on these areas by wheeled vehicles, but the major impacts will occur on those areas with slopes of less than 20 percent. Slopes of less than 20 percent occupy approximately 190,727 acres. Red Pass Lake, which occupies approximately 200 acres, is the only dry lakebed within the Alvord Alternative. The dry lakebed could be subject to impacts if military vehicles traverse it.

In summary, implementation of the Alvord Alternative would result in significant impacts on the soils due to crushing of rock outcrops, disturbance of desert pavement, compaction of upper soil layers, and wind and water erosion in an area of up to 190,727 acres. This is substantially greater than the 640 acres of desert soils significance criterion and approximately 86,517 acres less than the Proposed Action.

4.3.4.2 Mitigation

Mitigation measures incorporated into this alternative would be the same as those discussed in Section 4.3.1.2 under the Proposed Action.

4.3.5 Superior Valley Alternative

4.3.5.1 Impacts

Approximately 20,109 acres of land within the Superior Valley Alternative consist of slopes greater than 20 percent, and approximately 264,776 acres consist of slopes less than 20 percent. Those areas of less than a 20-percent slope would be heavily impacted by the operation of tracked vehicles. Coyote Lake and Superior Dry Lakes 1 and 2, which comprise approximately 8,400 acres, could be impacted by the operation of military vehicles.

Approximately 25 percent of the mapped soils within this alternative area consist of Cajon soils and Adelanto soils, which are fine sands and sandy loams. These areas would not be as susceptible to permanent soil surface disruption, but when disturbed, would become significant sources for sand dune formation. Depositional areas are likely to occur southeast of the Boulder Utility Corridor (Corridor D). Approximately 35,000 acres could contribute significantly to sand dune formation when the vegetative cover is disturbed. Those depositional areas near I-15 may also provide source material that may affect transportation along I-15. It is not likely that sediment would be transported into the Cronese Lake or the Mojave River.

In summary, implementation of the Superior Valley Alternative would result in significant impacts on the soils due to crushing of rock outcrops, disturbance of desert pavement, compaction of upper soil layers, and wind and water erosion in an area of up to 264,776 acres. This is substantially greater than the 640 acres of desert soils significance criterion and approximately 12,468 acres less than the Proposed Action.

4.3.5.2 Mitigation

Mitigation measures incorporated into this alternative would be the same as those discussed in Section 4.3.1.2 under the Proposed Action.

4.3.6 Avawatz Alternative

4.3.6.1 Impacts

Areas with slopes greater than 20 percent comprise approximately 15,099 acres within the Avawatz Alternative. Approximately 170,401 acres of land consist of areas with less than 20-percent slope. These areas would be the most heavily impacted by operation of military vehicles within the Avawatz Alternative. Portions of Red Pass Lake and Coyote Dry Lake, approximately 6,800 acres, are located within this alternative and would sustain impacts if military vehicles were operated on their surfaces.

Mapped units within this alternative include Cajon, Adelanto, and Dune Land soils. Dune Land soils predominantly surround Coyote Dry Lake, and these soils could become a significant contributor to sand dune formation if repeatedly disturbed. Additional depositional areas are likely to occur southeast of Utility Corridor D between the Cronese and Soda Mountains. Windblown sand could reach I-15 as it approaches the Cronese Mountains. It is not likely that sediment would be transported into the Cronese Lake or the Mojave River.

In summary, implementation of the Avawatz Alternative would result in significant impacts on the soils due to crushing of rock outcrops, disturbance of desert pavement, compaction of upper soil layers, and wind and water erosion in an area of up to 170,401 acres. This is substantially greater than the 640 acres of desert soils significance criterion and approximately 106,843 acres less than the Proposed Action.

4.3.6.2 Mitigation

Mitigation measures incorporated into this alternative would be the same as those discussed in Section 4.3.1.2 for the Proposed Action.

4.3.7 No Action Alternative

Under the No Action Alternative, recreational, mining, grazing, and private development use would continue within the study area consistent with applicable land use plans: the CDCA Plan for public lands and the County of San Bernardino General Plan for private lands.

Estimated annual new soil disturbance within the study area under the No Action Alternative is as follows:

- mining - 10 acres,
- grazing - 20 acres,
- utilities - 30 acres, and
- private land development - 40 acres.

Total annual soil disturbance under the No Action Alternative is estimated at approximately 100 acres. Some natural rehabilitation of previous disturbances would also be occurring. Soil impacts from the No Action Alternative are not anticipated to be significant.

4.3.8 Cumulative Impacts

Eight of the cumulative projects will contribute to significant cumulative impacts on currently undisturbed soils. The eight projects, in addition to the Proposed Action or any of the alternatives discussed in detail, are five mining projects, two waste treatment/disposal projects, and one roadway/access corridor project. The potential significant soils impacts related to the various projects are expected to be temporary in nature (i.e., soil disturbance and aeolian or hydraulic erosion occurring only during construction phases or occasional uses). Table 4.3-1 shows the acres of soil disturbance that may result from each project. Table 4.3-2 shows the total potentially disturbed acreage in combination with the Proposed Action and the alternatives discussed in detail.

Table 4.3-1

POTENTIAL SOIL DISTURBANCE FROM CUMULATIVE PROJECTS

Project	Acres
Fort Cady Minerals Project	341
Hector Mine Expansion	175
NavFacEngCom Road Request	950
Rail Cycle Solid Waste Disposal Project	2,100
Ward Valley LLRW Disposal Site	90
America Mine Project	1,355
Castle Mountain Mine Project	115
MolyCorp Mine Project	932
Total	6,058

Table 4.3-2

POTENTIAL SOIL DISTURBANCE FROM CUMULATIVE PROJECTS WITH PROJECT ALTERNATIVES

Alternatives	Acres
Proposed Action (Silurian Valley)	283,220
Modified Avawatz-Silurain	232,769
Modified Coyote Basin	242,233
Alvord	196,703
Superior Valley	270,752
Avawatz	176,377
No Action	6,071

4.3.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.3-3. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.3-4.

Table 4.3-3

SOILS - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz	No Action
Soil disturbance from military vehicles	Significant impacts associated with soil disturbance. Heaviest vehicle use on 277,244 acres. Significant increase in soil erosion.	Significant impacts associated with soil disturbance. Heaviest vehicle use on 226,793 acres. Significant increase in soil erosion.	Significant impacts associated with soil disturbance. Heaviest vehicle use on 236,175 acres. Significant increase in soil erosion.	Significant impacts associated with soil disturbance. Heaviest vehicle use on 190,727 acres. Significant increase in soil erosion.	Significant impacts associated with soil disturbance. Heaviest vehicle use on 264,776 acres. Significant increase in soil erosion.	Significant impacts associated with soil disturbance. Heaviest vehicle use on 170,401 acres. Significant increase in soil erosion.	No impact.
Impacts on dry lakebeds	Potential significant impact on 2,470 acres of dry lakebeds.	Potential significant impact on 2,470 acres of dry lakebeds.	Potential significant impact on 5,469 acres of dry lakebeds.	Potential significant impact on 200 acres of dry lakebeds.	Potential significant impact on 8,400 acres of dry lakebeds.	Potential significant impact on 6,800 acres of dry lakebeds.	No impact.

Table 4.3-4

SOILS - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives						
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz	No Action
Soil Disturbance	Unavoidable significant impacts from disturbance of 277,244 acres of desert soils.	Unavoidable significant impacts from disturbance of 226,793 acres of desert soils.	Unavoidable significant impacts from disturbance of 236,175 acres of desert soils.	Unavoidable significant impacts from disturbance of 109,727 acres of desert soils.	Unavoidable significant impacts from disturbance of 264,776 acres of desert soils.	Unavoidable significant impacts from disturbance of 170,401 acres of desert soils.	No impact.
Dry Lakebeds	Military vehicles restricted from dry lakebeds.	Military vehicles restricted from dry lakebeds.	Military vehicles restricted from dry lakebeds.	Military vehicles restricted from dry lakebeds.	Military vehicles restricted from dry lakebeds.	Military vehicles restricted from dry lakebeds.	Military vehicles restricted from dry lakebeds.

4.4 WATER RESOURCES

Criteria used to assess significance for groundwater and surface water impacts are as follows:

- A significant impact will occur to groundwater resources if (1) water table levels are reduced to such an extent that spring flows are diminished or production at existing wells within that basin or adjacent interconnected basins falls below economically feasible or practical engineering limits, or (2) groundwater quality changes occur because of increasing salinity or mineral content that can negate the water's value for domestic, industrial, or agricultural consumption.

- A significant impact on surface water resources will result if (1) existing drainage patterns are altered, or (2) the quality of ephemeral surface water resources available for wildlife at dry lakes, spring flows, or linear riparian systems with ephemeral flows is degraded. Similarly, increases in water quality constituents that could lead to violation of specific state and federal standards will also be considered significant impacts. Any measurable increase in California State Department of Health Services' general mineral and general physical standards for public water systems (drinking water standards) will be used to judge significance of impacts. Impacts will be considered significant if springs and wetland resources, as defined in Executive Order 11990 or the Clean Water Act, are degraded.

4.4.1 Proposed Action

4.4.1.1 Impacts

Groundwater

Because operations are planned over water-bearing sediments, existing NTC groundwater quality could be slightly degraded. Potentially affected groundwater basins are Death Valley Basin, Denning Spring Valley Basin, and Valjean Valley Basin. To minimize this potential impact, where practicable, the Proposed Action limits activities in active recharge zones. Therefore, activities would not have a significant effect on groundwater recharge and/or quality.

Use of areas not previously used for training could result in potential spill impacts from vehicle use, gasoline transfer and storage, and field vehicle maintenance activities. Storing and handling hazardous materials in the study area could result in more accidental spills. The length of time required for accidental spills to infiltrate the groundwater table varies with annual precipitation and the composition of soil layers. In the Mojave Desert, precipitation is low enough that nonvolatilized leachate from accidental surface petroleum spills would require many years to reach the groundwater table. No significant impacts are expected to occur.

Surface Water

Operations would create erosion and loose particles. During rain events, these materials could be transported and deposited into dry lakebed areas and washes. During rain events, runoff from the Avawatz Mountains will flow into the Silurian Valley and then into Silver Lake. As these waters flow, they will naturally pick up loose sediments and eventually deposit them into the lake. Because of this sediment transport, the total suspended load of fine clays to the lake may be elevated for several days following rainfall runoff events.

Tank and other tracked vehicle operations would disturb the existing soils (heaviest disturbance on 277,244 acres) and could alter the natural drainage system. If the natural drainage system is altered, flows would likely cut new drainage routes that would eventually drain into dry lakebeds. These additional drainage routes would induce additional erosional patterns onsite and possibly offsite. Depending on the disturbance created by the new flows, the amount of new sediment disturbed, and the potential for new erosion to occur, this could result in significant impacts.

Springs in the Silurian Valley that could potentially be impacted include Owl Hole, Denning, Cottonwood, Sheep Creek, Salt, Unnamed, Old Mormon, and Cave Springs. These areas would have the potential to be significantly impacted during NTC operations; however, the perennially wet soils in these areas are not suitable for operation of tanks, tracked vehicles, or wheeled vehicles. In addition, some of the springs are located within steep canyons that would be difficult for military equipment to access. Therefore, these areas would be avoided by military vehicles.

These springs would not be used as a source for human consumption in association with Army activities; therefore, spring water drawdown would not be affected by the Proposed Action. It is not anticipated that spring water quality would change significantly over what currently exists. Thus, impacts would not be significant.

4.4.1.2 Mitigation

The mitigation measure(s) below shall be implemented to protect surface water resources.

1. Direct access to springs identified for this alternative shall be restricted by installing fencing and/or metal crossbars to prohibit encroachment.

2. Field personnel will avoid springs and riparian areas. Staff will be briefed prior to exercises, and appropriate signage and fencing will be used.

3. Once installed, post instrumentation and communication systems shall be used during military exercises to track and direct vehicles away from spring areas.

4.4.2 Modified Avawatz-Silurian Alternative

4.4.2.1 Impacts

The Modified Avawatz-Silurian Alternative would involve the same groundwater basins as those discussed in Section 4.4.1.1. Because the alternative would limit activities in active recharge zones, no significant impacts are expected.

Tank and other tracked vehicle operations would disturb the existing soils (heaviest disturbance on 226,793 acres) and could destroy the natural drainage system and potentially cause additional erosion patterns. This may result in significant impacts. This alternative would also involve the same springs as those discussed in Section 4.4.1.1. With avoidance of these springs, no significant impacts are expected.

4.4.2.2 Mitigation

Surface water and spring mitigation measures for this alternative would be the same as those outlined in Section 4.4.1.2.

4.4.3 Modified Coyote Basin Alternative

4.4.3.1 Impacts

The Coyote Basin is the only potentially affected groundwater basin found within this alternative. Because the alternative would limit activities in active recharge zones, no significant impacts are expected.

Tank and other tracked vehicle operations would disturb the existing soils (heaviest disturbance on 236,175 acres) and could destroy the natural drainage system and potentially cause additional erosion patterns. This may result in significant impacts.

Surface drainages and playas that could be impacted under this alternative include flows from the Alvord Mountains draining toward Coyote Lake, flows from the Cronese and the Soda Mountains draining toward West Cronese Lake, and flows from the Cronese Mountains draining toward the Cronese Lakes and possibly the Mojave River. The potential impacts would be similar to those outlined in Section 4.4.1.1.

Springs potentially impacted by this alternative include Jack Spring, Jack Rabbit Spring, and Paradise Springs. Jack Spring and Jack Rabbit Spring would have the potential to be impacted during NTC operations; however, the soils in these areas are not suitable for operation of tanks, tracked vehicles, or wheeled vehicles.

4.4.3.2 Mitigation

Surface water and spring mitigation measures for this alternative would be the same as those outlined in Section 4.4.1.2.

4.4.4 Alvord Alternative

4.4.4.1 Impacts

The Coyote Basin is the only potentially affected groundwater basin found within this alternative.

Because activities would be limited in active recharge zones, no significant impacts are expected.

Tank and other tracked vehicle operations would disturb the existing soils (heaviest disturbance on 190,727 acres) and could destroy the natural drainage system and could potentially induce additional erosion patterns. This may result in significant impacts.

This alternative would also impact the same springs as those discussed in Section 4.4.3.1. Significant impacts may result with implementation; these impacts can be mitigated to a level of nonsignificance as described in Section 4.4.1.2.

4.4.4.2 Mitigation

Surface water and spring mitigation measures for this alternative would be the same as those outlined in Section 4.4.1.2.

4.4.5 Superior Valley Alternative

4.4.5.1 Impacts

The Coyote Basin is the only potentially affected groundwater basin found within this alternative. Because activities would be limited in active recharge zones, no significant impacts are expected.

Tank and other tracked vehicle operations would disturb the existing soils (heaviest disturbance on 264,776 acres) and could destroy the natural drainage system and potentially cause additional erosion patterns. This may result in significant impacts.

This alternative would also impact the same springs as those discussed in Section 4.4.3.1. Significant impacts may result with implementation; however, these impacts can be mitigated to a level of nonsignificance (Section 4.4.1.2).

4.4.5.2 Mitigation

Surface water and spring mitigation measures for this alternative would be the same as those outlined in Section 4.4.1.2.

4.4.6 Avawatz Alternative

4.4.6.1 Impacts

The Coyote Basin is the only potentially affected groundwater basin found within this alternative. Because activities would be limited in active recharge zones, no significant impacts are expected.

Tank and other tracked vehicle operations would disturb the existing soils (heaviest disturbance on 170,401 acres) and could destroy the natural drainage system and potentially cause significant impacts.

This alternative would also impact the same springs as those discussed in Section 4.4.3.1. Significant impacts may result with implementation; however, these impacts can be mitigated to a level of nonsignificance as described in Section 4.4.3.2.

4.4.6.2 Mitigation

Surface water and spring mitigation measures for this alternative would be the same as those outlined in Section 4.4.1.2.

4.4.7 No Action Alternative

Under the No Action Alternative projected use levels may or may not result in significant drawdown of Irwin, Bicycle, and Langford Basins.

Residents of the area report adequate water supplies for their needs. With implementation of the WMLTA Project on approximately 30 percent of the study area west of Fort Irwin Road, residential development would be reduced on private lands in that area. This reduction in private land development and reduced potential for water resource impacts would also occur in other action alternatives not involving lands west of Fort Irwin Road. Residential development would be expected to continue to increase over time in some areas of the remainder of the study area, and water quality would be slightly reduced in the long term in those areas as groundwater levels drop. Future water development and use would also be regulated by the Mojave Water Agency-administered water adjudication for parts of the area. Impacts on water quantity and quality from future development would be minimized by administration of the water adjudication decision and other water conservation measures.

Activities that would continue to occur on public lands administered by BLM within the study area include right-of-way construction for utility lines, communications sites, and roads; mineral exploration and development; livestock grazing; and dispersed and concentrated recreation activities, including hunting. Minor increases in eroded sediment would be expected from short-term and temporary activities from which the desert can recover over time. Activities with long-lasting effects would involve an estimated 5 percent of the study area. The long-term effects are anticipated to result in a minimal loss of protective vegetative cover and subsequent observable surface erosion and marginally elevated levels of suspended solid loads being carried to lakebeds during rain events. Impacts would be less than significant.

Potential impacts on springs located in that area are uncertain. A small potential exists for human-induced impacts from mining or vehicle use in these areas since the surface springs are within areas designated as legislative WSAs. Under the BLM interim wilderness management policy, mining and access to those areas would be significantly restricted or prohibited.

4.4.8 Cumulative Impacts

The NTC uses its share of the groundwater within the region and will contribute to an overall slow, but potential eventual drawdown of groundwater basins. However, over the past few years the groundwater basins used by the NTC have increased in volume. Acquisition of the additional lands would not affect this impact because water consumption would not be substantially increased.

Implementation of the Proposed Action and the other acquisition alternatives will add to the overall water quality impacts of the area. This impact is not considered significant on a regional scale.

4.4.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.4-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.4-2.

Table 4.4-1

WATER RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Groundwater	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Surface Water	Potential significant impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential significant impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential significant impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential significant impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential significant impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential significant impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	No significant impact.

Table 4.4-2

WATER RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Groundwater	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
Surface Water	Impacts on springs not significant after mitigation. Potential significant impacts remain for surface drainage alteration and erosion.	Impacts on springs not significant after mitigation. Potential significant impacts remain for surface drainage alteration and erosion.	Impacts on springs not significant after mitigation. Potential significant impacts remain for surface drainage alteration and erosion.	Impacts on springs not significant after mitigation. Potential significant impacts remain for surface drainage alteration and erosion.	Impacts on springs not significant after mitigation. Potential significant impacts remain for surface drainage alteration and erosion.	Impacts on springs not significant after mitigation. Potential significant impacts remain for surface drainage alteration and erosion.	No significant impact.

4.5 BIOLOGICAL RESOURCES

Significance Criteria

The Proposed Action and alternatives may have substantial impacts on vegetation and wildlife habitat through loss of individuals and viable communities, loss of food sources, disruption of travel corridors and nesting areas for wildlife, and affects of increased dust and erosion on vegetation.

Impacts on plants and wildlife are considered significant if one or more of the following criteria are met with implementation of the Proposed Action:

- loss of individuals or populations of a listed endangered or threatened species or its habitat;
- loss of critical and/or declining wildlife habitat that is sensitive or rare in the region in question, such as riparian woodlands, wetlands, cliff face formations, and surface water sources;
- substantial loss of populations or habitat of a Federal Candidate, regionally rare, or otherwise sensitive species that would jeopardize the continued existence of the species in the region;
- loss or long-term disruption of a major wildlife movement corridor;
- loss of at least 5 percent of undisturbed habitat(s) encompassing a contiguous biogeographic region, such as that found in a single valley, mountain range, or coastline;
- substantial loss of natural vegetation that is slow to recover; and/or
- substantial loss of species or community diversity in natural vegetation and wildlife habitat.

The definition of "substantial" depends on the species in question. Mitigation measures must be provided for all impacts deemed significant, unless an impact is considered unmitigable.

4.5.1 Proposed Action

4.5.1.1 Impacts

General Vegetation

Table 4.5-1 lists the acreages the plant communities impacted by the Proposed Action and the other alternatives. The Proposed Action will potentially impact up to 331,217 acres of native vegetation with the majority of the impacts expected to occur in areas (277,244 acres) of less than a 20-percent slope (Table 4.5-2). The direct impacts on vegetation that result from the Proposed Action will be expected to include the following:

- loss of vegetation from creation of staging areas,
- crushing of vegetation by military vehicles, and/or
- trampling or damage of vegetation from foot and military traffic.

Indirect impacts may result from erosion and dust created by military exercises.

Significant and potentially significant impacts on vegetation include large-scale loss of vegetation in concentrated activity areas that is slow to recover (mostly Mojave creosote scrub), vegetation trampling throughout the areas used for exercises, and loss of vegetation from soil erosion and compaction.

These types of impacts are discussed below with regard to general vegetation, sensitive species, and sensitive resources.

Staging Areas

Staging areas of up to 640 acres in size are planned for the Proposed Action and will be located in different places for up to 14 days at a time during each of the 12 rotations per year. Any vegetation type found on relatively flat terrain could be impacted depending on the placement of these staging areas. The vegetation types found in areas suitable for staging areas would be Mojave creosote bush scrub, Joshua tree woodland, desert saltbush scrub, active sand dunes and dune-creosote bush scrub, and stabilized and partially stabilized desert sand fields.

Table 4.5-1

PLANT COMMUNITY ACREAGE FOR THE PROPOSED ACTION AND EACH ALTERNATIVE

Plant Community Type	Proposed Action	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Mojave creosote bush scrub	294,032	239,284	206,332	172,323	183,338	137,903
Mojave creosote bush scrub/Joshua tree woodland mix	0	0	17,216	17,168	33,951	17,189
Joshua tree woodland	17,253	16,991	0	0	4,822	0
Joshua tree woodland/Mojave woody scrub mix	0	0	741	767	10,416	770
Desert saltbush scrub	3,666	1,110	15,222	10,411	13,412	13,212
Desert sink scrub	0	0	3,954	942	3,809	3,923
Mojave mixed woody scrub	0	0	0	0	4,923	0
Crucifixion thorn woodland	0	0	1,005	997	0	0
Open playa or alkali playa	0	0	2,060	2,212	733	293
Mojave wash scrub	0	0	5,815	5,716	4,877	5,022
Freshwater seep or spring	285	0	439	44	422	434
Freshwater seep/Mojave wash scrub	533	552	0	0	0	0
Alkali seep	0	0	403	220	389	401
Saline hills	283	293	0	0	0	0
Stabilized and partially stabilized desert sand fields	8,254	5,133	0	0	0	0
Active sand dunes and dune/creosote bush scrub	2,378	1,959	0	0	0	0
Disturbed, no vegetation, dry lakebeds	4,533	4,708	6,283	0	23,793	6,353
TOTAL	**331,217**	**270,030**	**259,470**	**210,800**	**284,885**	**185,500**

Table 4.5-2

POTENTIAL IMPACTS OF THE PROPOSED ACTION ON PLANT COMMUNITIES

Plant Community Type	Acres	Percent of Total Acreage	Acres at <20% Slope	Percent of Community at <20% Slope
Mojave creosote bush scrub	294,032	89	256,325	87
Mojave creosote bush scrub/Joshua tree woodland mix	0	0	0	0
Joshua tree woodland	17,253	5	2,845	16
Joshua tree woodland/Mojave woody scrub mix	0	0	0	0
Desert saltbush scrub	3,666	1.1	3,307	90
Desert sink scrub	0	0	0	0
Mojave mixed woody scrub	0	0	0	0
Crucifixion thorn woodland	0	0	0	0
Open playa or alkali playa	0	0	0	0
Mojave wash scrub	0	0	0	0
Freshwater seep or spring	285	<0.1	213	75
Freshwater seep/Mojave wash scrub	533	0.2	192	36
Alkali seep	0	0	0	0
Saline hills	283	<0.1	191	67
Stabilized and partially stabilized desert sand fields	8,254	2.5	8,177	99
Active sand dunes and dune/creosote bush scrub	2,378	0.7	1,530	64
Disturbed, no vegetation, dry lakebeds	4,533	1.4	4,464	98
TOTAL	**331,217**	**100**	**277,244**	**84***

* **Percent of total acres at <20 percent slope.**

Disturbance of up to 256,325 acres of Mojave creosote scrub may occur. This would constitute a significant impact.

Impacts on up to 2,845 acres of Joshua tree woodland may occur. This would constitute a significant impact. Joshua tree woodland is a community type endemic to the Mojave Desert and also serves as habitat for a related association of wildlife species. Also, the Joshua tree woodland found within the Silurian Valley presently contains very little disturbance. The majority of Joshua tree woodland within the Proposed Action area occurs on the slopes of the Avawatz Mountains. Approximately 2,845 acres of the entire 17,253 acres of Joshua tree woodland in the Proposed acquisition area occurs on topography suitable for staging areas or other areas of potentially high impact (a 20-percent slope or less).

The disturbance of areas containing stabilized or partially stabilized sand fields and sand dunes (9,707 acres) would constitute a significant impact because these communities are relatively rare within the Proposed Action area. They are considered by the California Natural Diversity Database (CNDDB) to be on the decline in California and are therefore considered sensitive. Areas containing dry lakebeds and springs or seeps will not be used, and no direct impacts are expected to occur in these communities.

Access Routes to Staging Areas

Vegetation will be impacted by using access roads to the staging areas. As discussed previously, the communities most likely to be impacted would be Mojave creosote bush scrub, Joshua tree woodland, desert saltbush scrub, active sand dunes and dune-creosote bush scrub, and stabilized or partially stabilized desert sand fields, again, depending on where the staging areas are ultimately placed. Because the staging areas will be placed in a different location during each rotation, it is not possible to estimate the acres of vegetation that would be impacted. Therefore, it must be assumed that any community occurring in terrain with a slope of less than 20 percent (less the dry lakebeds, springs, and seeps) has the potential to be impacted. Direct impacts on these communities, with the exception of the Mojave creosote bush scrub, would be significant.

Passes and Other Roads

Only existing roads through the Avawatz Mountains will be used so there will be no direct impacts expected on plant communities from the use of these roads.

The possible use of Old Mormon Springs Road is also currently under consideration. However, the condition and serviceability of the road have yet to be determined. The potential for significant impacts on sensitive plant species exists should this road be used and require widening or extending (see impact discussion under sensitive plant species). Direct impacts are mitigable.

Tank Crossings

Potential construction of six tank crossings (underpasses) is planned for areas along State Highway 127 in the Silurian Valley. Although the exact locations have yet to be determined, the structures may directly impact the nearby vegetation depending on the design of the crossings.

Trampling or Destruction of Vegetation

Battle Scenarios

Force-on-force maneuvers with tactical vehicles (such as tanks and Bradleys) will only occur within the existing boundaries of Fort Irwin. No battle scenarios will occur in the acquisition areas of the Proposed Action, so no direct impacts from force-on-force maneuvers are expected. However, tracked and wheeled vehicles will move through the acquisition area from the staging areas to the Fort Irwin battle zones. Moving vehicles from the staging areas to the battle zones will result in vegetation being crushed and soils being compacted. Based on the assumption that all areas of less than 20-percent slope may be used for vehicle movement, approximately 256,325 acres of Mojave creosote bush scrub may be impacted. Soil compaction is a limiting factor in the recovery of perennial species and the emergence of annual species and is thus a limiting factor to recovery of this community. This impact is significant and unavoidable.

Foot and Military Traffic

Trampling of vegetation by foot could result in direct impacts on vegetation in all areas with more than a 20-percent slope if the same areas are repeatedly subjected to this disturbance often enough so that root systems and seedlings are destroyed. Theoretically, any particular vegetation community within the proposed acquisition area would be accessible to foot traffic and therefore could sustain impacts. These impacts could be substantial in and around staging areas and other very high-use areas. The impact from trampling can be somewhat reduced by remaining on established routes and avoiding repeated use of a single area.

Fires

The presence of people and machinery may increase the potential for fires in the Proposed Action area. Adherence to mandatory fire safety measures will reduce the incidence of fires but may not completely eliminate the potential fire impacts.

Indirect Impacts from Erosion and Dust Created by Direct Impact Activities

Erosion

Heavy use of roads could potentially have significant indirect impacts on neighboring vegetation. The lack of vegetation and the disturbance of the soils will result in water runoff following rainfall. The runoff will cause soil erosion in the vegetation communities, potentially exposing roots and compromising the health of the plants. Using existing dirt roads in the Avawatz Mountains (as discussed previously) may increase compaction and erosion.

Compaction of soils by vehicles will result in significant indirect impacts on the vegetation communities in the Proposed Action area. Soil compaction often causes water runoff or alterations in water drainage, leading to eventual changes in vegetation patterns. Impacts can occur when the water runoff increases soil erosion, depletes nutrient levels in the soil, and detrimentally affects a plant community's fitness.

Dust

Use of staging areas and the movement of tracked and wheeled vehicles to and from the staging areas will create high levels of fugitive dust that could indirectly impact vegetation by settling on plants and decreasing photosynthetic capabilities. However, because dusty, windy conditions normally occur in the desert and the vegetation is adapted to these conditions, the impact of temporarily elevated dust levels and the temporary drop in plant productivity will be considered less than significant.

Sensitive Plants

Implementation of the Proposed Action would result in the loss of sensitive plants known to occur and would result in the loss of potential habitat for six sensitive species of plants (Table 4.5-3).

Three of the six sensitive plant species documented to date in the proposed expansion area are FSOCs (small-flowered androstephium, sand linanthus, and the New York Mountains cryptantha). The remaining three species have no federal or state standing to date.

Small-Flowered Androstephium

The population of small-flowered androstephium within the Proposed Action will be negatively impacted by activity in the low hills in the southern Silurian Valley. This small population (one individual) was located approximately 0.6 mile north-northwest of the northern end of Silver Lake and approximately 1,000 feet west of Highway 127. The loss of this single population of small-flowered androstephium would be considered less than significant impact because the population only consists of one individual.

Sand Linanthus

Eight of the nine documented populations of sand linanthus will also be impacted by potential military activities in the Silurian area. The population occurring in the Amargosa River floodplain will not be impacted because this area will serve as a buffer zone only. While once considered a sensitive plant in California, sand linanthus has been documented much more frequently since its former designation as a candidate. The impacts to the sand linanthus populations are considered less than significant.

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Table 4.5-3

SENSITIVE PLANTS AND RESOURCES IN PROPOSED ACTION AND EACH ALTERNATIVE

Sensitive Plant Species/ Common Name[1]	Status[2] Federal/State/CNPS	Proposed Action	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
1. *Eriophyllum mohavense* Barstow woolly sunflower	FSOC/none/1B					X	
2. *Sclerocactus polyancistrus* Mojave fishhook cactus	FSOC/none/1B			X	X	X	X
3. *Astragalus jaegerianus* Lane Mountain milkvetch	PE/none/1B			X	X	X	X
4. *Psorothamnus arborenscens* var. *arborenscens* Mojave indigobush	FSOC/none/4			X	X	X	X
5. *Cryptantha tumulosa* New York Mountains cryptantha	FSOC/none/4	X	X			X	
6. *Phacelia parishii* Parish's phacelia	FSOC/none/2			X	X	X	X
7. *Calochortus striatus* alkali mariposa lily	FSOC/none/1B			X		X	X
8. *Linanthus arenicola* sand linanthus	FSOC/none/2	X	X	X	X	X	X
9. *Castela emoryi* crucifixion thorn	CEQA/CEQA/2			X	X		
10. *Androstephium breviflorum* small-flowered androstephium	FSOC/none/1B	X	X	X	X	X	X
11. *Lupinus magnificus* var. *glarecola* Coso Mountains lupine	CEQA?/CEQA?/4	X	X				
12. *Tetradymia argyraea* striped horsebrush	CEQA?/CEQA?/4	X	X				

Table 4.5-3

SENSITIVE PLANTS AND RESOURCES IN PROPOSED ACTION AND EACH ALTERNATIVE

Sensitive Plant Species/ Common Name[1]	Status[2] Federal/State/CNPS	Proposed Action	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
13. *Draba california* California draba	CEQA?/CEQA?/4	X	X				
TOTAL		**6**	**6**	**8**	**7**	**9**	**7**
Known Springs		10+	10+	3+	3+	6+	6+

[1] **Note: Order of species follows Figure 3.5-2**

[2] **STATUS CODES**

CNPS

1B = Plants rare, threatened, or endangered in California and elsewhere

2 = Plants rare, threatened, or endangered in California but more common elsewhere

4 = plants of limited distribution; a watch list.

Federal/State

PE = Federally proposed, endangered

FSOC = Federal Species of Concern (former Federal Candidate Species)

CEQA? = Plant has no federal or state legal standing but is recommended by CNPS for evaluation for CEQA consideration

CEQA = Plant has no federal or state legal standing but CEQA consideration is mandatory

New York Mountains Cryptantha

The New York Mountains cryptantha occurs on ridges near springs in the Avawatz Mountains. Potential for impacts on this species exists from trampling. Restricting access to the nearby springs will most likely eliminate any impacts on some of the populations.

Coso Mountains Lupine

The Coso Mountains lupine is found in the rugged terrain of the Avawatz Mountains west of Silurian Valley. This species could be impacted by activity in the Avawatz Mountains but could be protected by limiting access to the nearby springs where the populations occur.

Striped Horsebrush and California Draba

Populations of undetermined size and extent of two additional noncandidate, although sensitive, species would be impacted under the Proposed Action. Populations of unknown size and extent of striped horsebrush occur in the Avawatz Mountains. As with the Coso Mountains lupine, this species may be partially protected by protecting the areas around the springs.

Populations of undetermined size and extent of California draba occur in the hills and in alluvial wash fans within the Silurian Valley. Because no information exists to date on exact population locations and size, and because the plants have been generally noted in habitats that are found throughout the Silurian Valley, avoidance is not feasible. Therefore, until such time as more detailed information is available, impacts are less than significant.

Potential Habitat for Other Sensitive Plant Species

Potential habitat for several sensitive species may be impacted. Ten species not found during any surveys to date still have some potential to occur onsite due to the presence of suitable habitat. Potential habitat for these species is considered very low.

Sensitive Resources

At least 10 springs have been documented within the boundaries of the Proposed Action (Bagley 1994). Eight springs have been documented in the rocky regions of Avawatz Mountains to date. The sensitive resources associated with the springs may be significantly impacted by military personnel and/or equipment. Significant impacts on the springs in the Proposed Action are mitigable by restricting access to these areas.

General Wildlife

Implementation of the Proposed Action will result in the loss or heavy disturbance of 272,780 acres of the wildlife habitat found within the boundaries of the Proposed Action. These acreages are based on the amount of habitat occurring in areas of less than 20-percent slope in which the training activities will occur. This value excludes disturbed areas and dry lakebeds, which are not considered wildlife habitat. Heavy vehicle movement areas will isolate formerly contiguous wildlife habitat, thus potentially disrupting wildlife movement between resource areas. Impacts on resident and migratory wildlife using habitats within these heavy vehicle use areas are considered significant.

Wildlife residing in areas adjacent to heavy use areas (e.g., support areas, vehicle access routes, and monitoring positions) will be subjected to indirect impacts, including locally intense stray lighting, dust, and noise from ground and air operations. Wildlife activities likely to be disturbed include daytime and nighttime foraging, nest and burrow construction and use, and reproduction. The level of disturbance is dependent on the particular species and the distance between wildlife populations and intensive ongoing disturbance. The increased levels of human disturbance will also result in the displacement of some species from the study area. For more elusive species that tend to avoid areas of human activity and disturbance, such as mountain lion and raptor species, subsequent reestablishment of the populations may not occur. However, some species, such as coyote and kit fox, tend to habituate to human disturbances and become reestablished in the area if a resource base exists. The overall impacts on wildlife populations and activity patterns outside the heavy use areas are considered less than significant.

The Proposed Action contains areas considered critical for wildlife. These areas include the Salt Creek riparian habitat, Sheep Creek Springs, Owl Hole Springs, and the tributaries of the Amargosa River. These areas provide water, roosting and nesting sites, and a prey base for a variety of resident and migratory wildlife. The Salt Creek area is currently protected as an ACEC by the BLM. This designation restricts all off-road activity in and around the site, and it protects the entire habitat from most human disturbance. The Proposed Action would result in the elimination of or substantial disturbance to these resource areas and their use by wildlife. These impacts would be considered significant without mitigation but will be reduced to levels that are less than significant with the mitigation incorporated into the Proposed Action.

The Proposed Action would impact several identified wildlife movement corridors, such as those found along the tributaries of the Amargosa River, Sheep Creek Springs, and Salt Creek. These impacts, which will result in the disruption or possible elimination of wildlife movement between resource areas, are considered significant.

Sensitive Wildlife

Desert Tortoise

Table 4.5-4 lists the area of each tortoise density category occurring in the Proposed Action and the other alternatives. The desert tortoise populations northeast and south of the Silurian Hills and associated Valjean Valley, an estimated total population of 650 animals, will be impacted by the Proposed Action. Although not included within the proposed heavy maneuvering area, this population falls within the proposed staging areas in the Valjean Valley. In addition, a small population of tortoises located near the Soda Mountains will also be impacted. The impacts will result from military maneuvers involving vehicular and ground personnel maneuvers and the construction of temporary facilities. This will result in the substantial reduction or complete extirpation of the desert tortoise populations due to the crushing of tortoises, the collapse of occupied burrows, and the elimination of critical food resources. The impacts on these populations are considered significant. Measures included as part of the terms and conditions in the Biological Opinion will reduce these impacts to less than significant. Table 4.5-5 lists the area of each desert tortoise density category on slopes of less than 20 percent that will be impacted by the Proposed Action and the other alternatives.

Approximately 6,000 acres of designated critical habitat will be impacted by implementation of the Proposed Action. This represents a loss of less than 1 percent of the critical habitat in California and the critical habitat within the Superior-Cronese unit.

Areas adjacent to heavy use areas might be subjected to increased noise and dust emissions, and sand dune formation (from blown sand generated in the maneuver areas). The approximate area that will be affected by these impacts is expected to be limited to within 1 to 2 miles northeast of the heavy use areas because the prevailing winds are from the southwest. This will include the Valjean Valley population of tortoises. If sediment is added to wash channels in areas of good tortoise habitat, it may result in modification of wash banks that might contain tortoise burrows. This potential impact represents a less than significant impact.

Military activities have the potential to generate trash, possibly resulting in the attraction of additional ravens to the expansion area and adjacent tortoise habitats. Ravens have been known to prey on juvenile tortoises, but it is unknown whether additional ravens would move into the new expansion area as a result of the presence of trash. Because the tortoise populations in the Proposed Action are relatively small, the impact from ravens is expected to be less than significant.

Mohave Ground Squirrel

The Mohave ground squirrel was not observed in the Silurian Valley, and it will not be expected to occur there because the Silurian Valley is not within the range of this species. Potential habitat (13,888 acres) exists for this species in the northwestern portion of this alternative, near the NAWS. Because the northern portion of this alternative will only be used as a buffer area, no impacts on the Mohave ground squirrel habitat located there will occur.

Other Sensitive Reptiles

The chuckwalla and Mojave fringe-toed lizard populations within the boundaries of the Proposed Action will be impacted. Military maneuvers on the dunes in the northeast portion of the study area or the

Table 4.5-4

AREA OF DESERT TORTOISE HABITAT OCCURRING IN EACH ALTERNATIVE (Acres)

Density Category (tortoises/mi²)	Proposed Action	Modified Avawatz Silurian	Modified Coyote Basin	Alvord Mountain	Superior Valley	Avawatz	No Action*
0-19	325,908	267,173	166,472	152,691	152,259	117,886	463,421
20-49	4,506	2,027	54,832	38,214	80,359	38,943	101,782
50-99	803	830	32,703	16,977	42,349	21,997	50,799
100-249	0	0	5,462	2,918	9,918	6,674	9,918
Total	**331,217**	**270,030**	**259,470**	**210,800**	**284,885**	**185,500**	**625,920**
* Encompasses the lands within the entire study area.							

Table 4.5-5

AREA OF DESERT TORTOISE HABITAT EXISTING ON SLOPES BELOW 20 PERCENT (Acres)

Density Category (tortoises/mi²)	Proposed Action	Modified Avawatz Silurian	Modified Coyote Basin	Alvord Mountain	Superior Valley	Avawatz	No Action*
0-19	273,130	225,443	149,631	137,643	137,904	105,869	324,415
20-49	3,741	2,006	50,349	34,726	76,684	36,726	91,998
50-99	803	830	30,936	15,277	40,417	21,457	46,245
100-249	0	0	5,259	2,796	9,223	6,305	8,380
Total	**277,674**	**228,279**	**236,175**	**190,442**	**264,228**	**170,357**	**471,038**
* Encompasses the lands below 20 percent slope in the entire study area.							

rocky habitats of the Avawatz and other mountain ranges will result in substantial loss of habitat and possible elimination of viable populations of both of these species within the study area. In the case of the Mojave fringe-toed lizard, the population extending into the acquisition area is an extension of the main populations found around the Dumont Dunes and Valjean Dunes. A similar situation exists for the chuckwalla. These individuals are part of a larger population located throughout the Avawatz Mountains. Elimination of these local populations within this alternative will occur. Because the impacts would not jeopardize the existence of the main populations in the immediate vicinity, impacts will be considered less than significant.

Raptors

The Proposed Action will have an impact on sensitive raptor species occurring in the acquisition area. The disturbance of riparian areas, such as the Amargosa River, Salt Creek, Sheep Creek Spring, Owl Hole Spring, and other water sources, could impact raptor roosting and nesting sites. Increased disturbance from human activity will result in a decline in prey populations (e.g., reptiles, rodents, rabbits, and so forth), making habitat onsite unsuitable for foraging. Species such as the burrowing owl, which nests on the ground in burrows, will be particularly impacted. Both prey species and nesting sites for this owl will be substantially altered, and population numbers will decline. Protection of springs would serve to minimize impacts on some of the sensitive raptor species. Impacts on raptors are expected to be less than significant.

Gila Woodpecker

The Gila woodpecker is one of two species observed in the project area with formal protection status. Although the range of this species in California is primarily along the Colorado River and in parts of Imperial County, it may wander to other areas during nonbreeding seasons (CDFG 1990). The Proposed Action will have a direct impact on this species and all migratory species that use the water resources available within the project boundary. Substantial human disturbance to areas such as Sheep Creek Spring and Owl Hole Spring could influence the survival of migratory species that depend on these permanent resources during each migration by forcing these species to find alternative water sources along the migratory route. This impact is considered potentially significant.

Other Sensitive Birds

Species such as the black-tailed gnatcatcher, loggerhead shrike, and LeConte's thrasher occur within the boundaries of this alternative in substantial numbers and will be impacted by the Proposed Action. Heavy disturbance in the area will result in the initial displacement of most species. Depending on the intensity of the disturbance, a possibility exists that these species may eventually habituate and become reestablished in areas where training activities do not occur on a regular basis. This impact is considered less than significant.

Sensitive Bats

The Proposed Action will impact roosting sites of sensitive resident and migratory bat species. Disturbance of existing abandoned mineshafts and natural caves, which occur in the project area, will eliminate many potential bat roosting sites. Human disturbance in areas such as Sheep Creek Spring and Owl Hole Spring will eliminate critical water resources required of all bat species. Potential impacts will be mitigated to a nonsignificant level due to continued avoidance of all springs, caves, and mineshafts by military personnel.

Badger

The Proposed Action will impact any potential or existing badger habitat, particularly in the southeast portion of the project area near the base of the Silurian Hills. Heavy disturbance from human activity in the project area will result in a loss of badger habitat and a substantial decline in prey populations (e.g., rodents [particularly ground squirrels] and reptiles). Because of the low number of badgers expected and the lack of formal protection for this species, this impact is considered less than significant.

Nelson's Bighorn Sheep

The Proposed Action will impact potential movement corridors of the Nelson's bighorn sheep population

known to occur in the Avawatz Mountains. Increased disturbance from human activity along the northern and southern ends of the Avawatz Mountains will result in the loss or long-term disruption of the movement corridors established by Nelson's bighorn sheep. They use these corridors to reach other established populations and access critical resources in adjacent mountain ranges. It is necessary to maintain these corridors so that the gene pool of the population remains viable. This impact is considered significant.

4.5.1.2 Mitigation

General Vegetation

1. Foot traffic in areas with a slope of more than 20 percent shall avoid repeated disturbance to the same area whenever possible.

2. Widening of roads, if necessary, shall avoid sensitive vegetation communities wherever possible. A buffer zone, at a width to be established in consultation with the appropriate resource agency, shall be established between sensitive communities and roads.

3. Dunes in the northeast portion of the study area will be off limits to military maneuvers.

Sensitive Plants

Implementation of the Proposed Action will not result in significant impacts to any listed or candidate species of plants; therefore, no mitigations are required.

General Wildlife

Significant impacts on wildlife habitat and movement corridors in the maneuver areas are unmitigable because these areas are critical for the Proposed Action.

Significant impacts on sensitive wildlife resources can be reduced to less than significant with implementation of the following mitigation measures.

4. Hunting and fishing shall not be allowed within any acquisition areas.

5. The 10 springs in the Avawatz region in the Silurian Valley shall be put off limits. Barrier fences shall be installed to protect the springs (Figure 4.5-1).

6. Access to the Salt Creek riparian habitat, Sheep Creek, Owl Hole Spring, and the tributaries of the Amargosa River shall be restricted.

Sensitive Wildlife

Desert Tortoise

7. Per the Biological Opinion, tortoise-proof fencing shall be placed along the boundary of the training area, as shown on Figure 4.5-1, southeast of the geological feature known as "the whale."

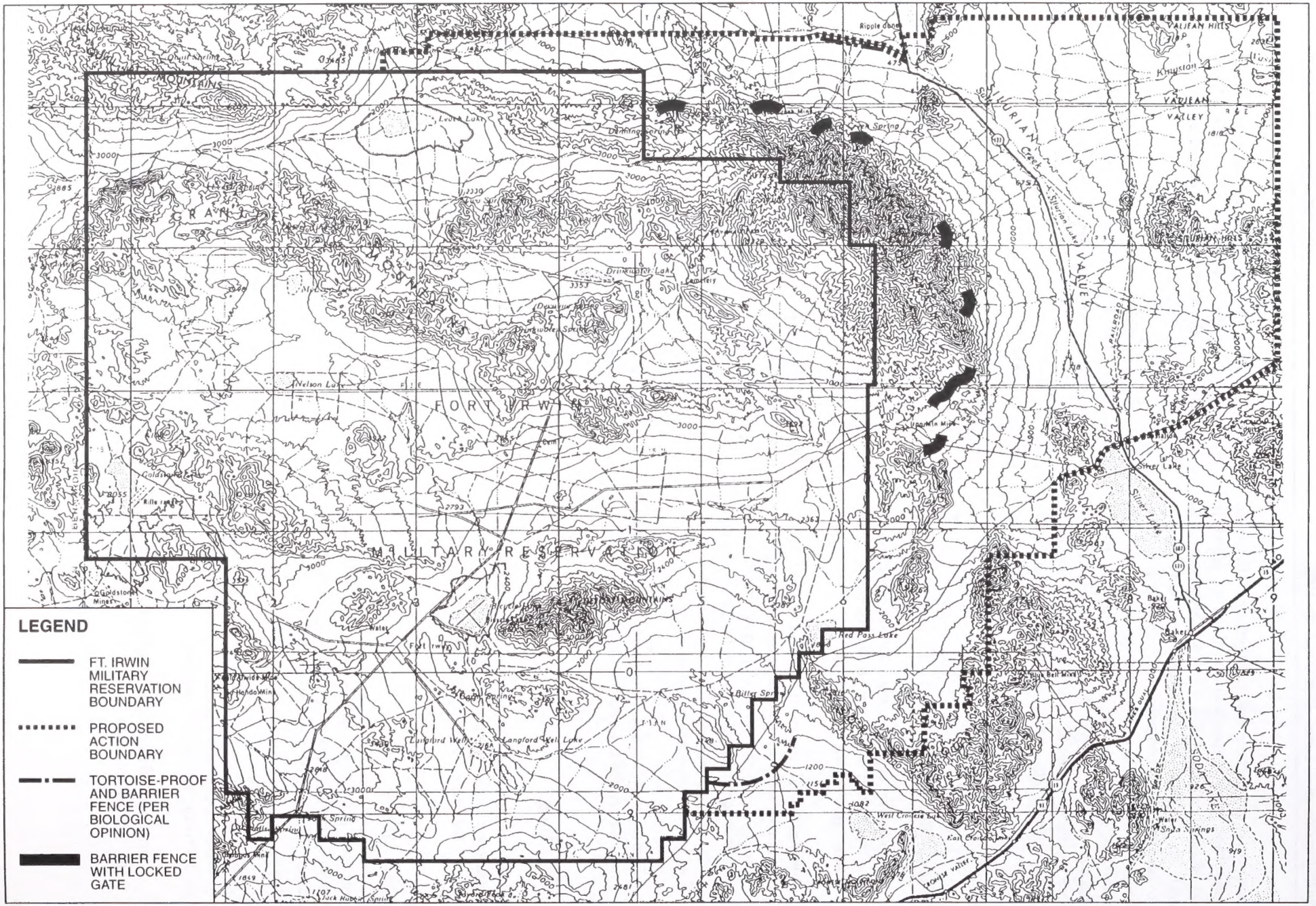
8. Identified tortoise populations of greater than 20 tortoises/square mile shall be protected with a 1-kilometer buffer zone. This buffer zone shall be enforced using signage and available technology used by the Army.

9. The NTC should initiate efforts to take an active role in the recovery of the desert tortoise. Participation in planning efforts for the WMCMP could constitute a means of undertaking such recovery efforts.

10. The NTC shall continue to support the ongoing Juvenile Tortoise Research Project (JTREP) on the installation, subject to availability of funding and in consultation with the USFWS.

11. The NTC shall monitor all of the fencing and off-limits areas.

12. The existing NTC desert ecology/desert tortoise education program shall be expanded to increase awareness of desert ecology and the importance of eliminating adverse impacts on tortoises and other sensitive species found on the base and within the expansion area. This program shall continue to be provided to soldiers, family members, and rotational units, and shall be expanded to include the NTC contract and government workforce, especially those who work on the ranges.



PROPOSED ACTION - LOCATIONS OF FENCE TYPES
Figure 4.5-1

Soldiers permanently stationed at the NTC shall attend a formal briefing on tortoises, other sensitive species, and locations of protected areas. Rotational units shall continue to be informed on desert ecology and sensitive species upon arrival at NTC and prior to their field exercises.

An educational video shall be prepared to be shown at appropriate briefings and made available to other groups on Fort Irwin (i.e., Boy/Girl Scouts, Officer and Civilian Wives Club, and unit spouse groups). A presentation for school children shall occur at on-base schools each school year. Additional forms of educational distribution shall include informational bulletins and signs, educational notices in the post newspaper, and broadcasting on the post information channel.

All trash and refuse shall be promptly contained and regularly removed from the training areas to reduce their attractiveness to common ravens and other desert tortoise predators.

Other Sensitive Wildlife

13. Caves and mineshafts shall be placed off limits.

14. Nelson's bighorn sheep habitat shall be conserved, and any human-induced barriers to sheep movement shall be minimized. All potential water sources for this species shall be preserved.

4.5.2 Modified Avawatz-Silurian Alternative

4.5.2.1 Impacts

General Vegetation

The Modified Avawatz-Silurian Alternative will potentially impact up to 270,030 acres of native vegetation with the majority of impacts expected to occur in those areas (226,793 acres) of less than a 20-percent slope (Table 4.5-6). The types of impacts on vegetation that will result from this alternative are the same as those previously discussed for the Proposed Action (Section 4.5.1.1). These impacts are discussed below with regard to general vegetation, sensitive plant species, and sensitive resources.

Staging Areas

Staging areas and other areas of repeated use will cause significant impacts on the vegetation communities. Any vegetation type found on relatively flat terrain could be impacted, depending on the placement of these staging areas. Disturbance of 211,670 acres of Mojave creosote scrub will constitute a significant impact.

Impacts on up to 2,700 acres of Joshua tree woodland will constitute a significant impact because it is a community type endemic to the Mojave Desert and also serves as habitat for a related association of wildlife species. Because the majority of the 16,991 acres of Joshua tree woodland within this Modified Avawatz-Silurian Alternative occurs on the slopes of the Avawatz Mountains, with only 2,700 acres occurring on topography suitable for staging areas (a 20-percent slope or less), impacts on this portion of the Joshua tree woodland are avoidable by not using this area for staging.

The disturbance of areas containing sand dunes and stabilized or partially stabilized sand fields (6,330 acres) would constitute a significant impact because these communities are relatively rare within the Modified Avawatz-Silurian Alternative compared to the Mojave creosote bush scrub and are considered by the CNDDB to be communities on the decline in California and are therefore sensitive. Significant direct impacts on these communities from the establishment of staging areas are avoidable by locating staging areas away from these communities. Areas containing dry lakebeds and springs or seeps will not be used, and no direct impacts are expected to these communities.

Access Routes to Staging Areas

Impacts associated with access routes and staging areas are the same as those discussed in the Proposed Action (Section 4.5.1.1).

Passes and Other Roads

As discussed in the Proposed Action (Section 4.5.1.1), only existing dirt roads through the Avawatz Mountains will be used, and no new road construction is planned. Any modifications to Old Mormon Springs Road may directly impact sensitive plant species.

Table 4.5-6

POTENTIAL IMPACTS OF THE MODIFIED AVAWATZ-SILURIAN ALTERNATIVE ON PLANT COMMUNITIES

Plant Community Type	Acres	Percent of All Acreage	Acres at <20% Slope	Percent of Community at <20% Slope
Mojave creosote bush scrub	239,284	89	211,670	88
Mojave creosote bush scrub/Joshua tree woodland mix	0	0	0	0
Mojave creosote bush scrub/desert saltbush scrub	0	0	0	0
Joshua tree woodland	16,991	6	2,700	16
Joshua tree woodland/Mojave woody scrub mix	00	0	0	0
Desert saltbush scrub	1,110	0.4	1,067	96
Desert sink scrub	0	0	0	0
Mojave mixed woody scrub	0	0	0	0
Crucifixion thorn woodland	0	0	0	0
Open playa or alkali playa	0	0	0	0
Mojave wash scrub	0	0	0	0
Freshwater seep or spring	0	0	0	0
Freshwater seep/Mojave wash scrub	552	0.2	199	36
Alkali seep	0	0	0	0
Saline hills	293	0.1	197	67
Stabilized and partially stabilized desert sand fields	5,133	1.9	5,100	99
Active sand dunes and dune/creosote bush scrub	1,959	0.7	1,230	63
Bursage scrub	0	0	0	0
Disturbed, no vegetation, dry lakebeds	4,708	1.7	4,630	98
TOTAL	**270,030**	**100**	**226,793**	**84***

* **Percent of total acres at <20 percent slope.**

Tank Crossings

The impacts associated with the six tank crossings (undercrossings) along State Highway 127 in the Silurian Valley are the same as those described for the Proposed Action (Section 4.5.1.1).

Trampling or Destruction of Vegetation

Battle Scenarios

The impacts associated with maneuvers in the Modified Avawatz-Silurian Alternative are expected to be similar to those described for the Proposed Action (Section 4.5.1.1). Based on the assumption that all areas below 20 percent may be impacted, approximately 211,670 acres of Mojave creosote bush scrub may be significantly impacted by vehicle movement. This impact is significant and unavoidable.

Foot and Military Traffic

Impacts associated with foot and military traffic are expected to be similar to those described for the Proposed Action (Section 4.5.1.1).

Fires

The potential impacts associated with a rise in the incidence of fires are the same as those described for the Proposed Action (Section 4.5.1.1).

Indirect Impacts from Erosion and Dust Created by Direct Impact Activities

Erosion

The impacts associated with erosion are expected to be the same as those described for the Proposed Action (Section 4.5.1.1).

Dust

The impacts associated with elevated dust levels are the same as those described for the Proposed Action (Section 4.5.1.1).

Sensitive Plants

Implementation of the Modified Avawatz-Silurian Alternative would not result in the loss of any listed or candidate species of plants, but it would result in the loss of habitat for sensitive plants. The general species, potential sensitive species, and impacts are the same as those discussed under the Proposed Action (Section 4.5.1.1).

Sensitive Resources

All springs discussed in the Proposed Action (Section 4.5.1.1) would be impacted in this Modified Avawatz-Silurian Alternative with the exception of Armagosa Spring and Salt Creek Hills, which are outside of the Modified Avawatz-Silurian Alternative's boundaries.

General Wildlife

Implementation of the Modified Avawatz-Silurian Alternative will result in the loss or heavy disturbance of 222,163 acres of the wildlife habitat found within the boundaries of this alternative. These acreages are based on the amount of habitat occurring in areas of less than 20-percent slope in which the most intensive use will occur. This value also excludes disturbed areas and dry lakebeds, which are not considered wildlife habitat. Heavy use areas will isolate formerly contiguous wildlife habitat, thus potentially disrupting wildlife movement between resource areas. Impacts on resident and migratory wildlife using habitats within this intensive impact area are considered significant.

Implementation of this alternative is expected to result in similar impacts as those described for the Proposed Action (Section 4.5.1.1).

The Modified Avawatz-Silurian Alternative encompasses the same critical wildlife areas mentioned in the discussion of the Proposed Action with the exception of the riparian habitat within the Salt Creek ACEC. This area will not be impacted by activities associated with this alternative because it is located outside of the boundary of this alternative.

Sensitive Wildlife

Desert Tortoise

Table 4.5-4 lists the area of each tortoise density category occurring in this alternative. The potential impact of the Modified Avawatz-Silurian Alternative on the desert tortoise population is generally the same as that for the Proposed Action except that the small population of tortoises near the Soda Mountains will not be impacted. Table 4.5-5 lists the area of each density category below 20-percent slope in this alternative. The area above 20-percent slope in the Silurian Hills is not included as part of the Modified Avawatz-Silurian Alternative. Because the tortoises are generally found below 20-percent slope, the assumption is made that the Modified Avawatz-Silurian Alternative encompasses the entirety of the desert tortoise populations northeast and south of the Silurian Hills and associated Valjean Valley. The estimated total population in this alternative is assumed to be approximately 650 tortoises.

The impacts on desert tortoises relating to dust, noise, and ravens are the same as those described for the Proposed Action (Section 4.5.1.1).

Approximately 2,222 acres of designated critical habitat will be impacted by implementation of the Avawatz-Silurian Alternative. This represents a loss of less than 0.05 percent of the critical habitat in California and the critical habitat in the Superior-Cronese unit.

Mohave Ground Squirrel

The potential impacts on Mohave ground squirrel habitat (13,888 acres) resulting from implementation of the Modified Avawatz-Silurian Alternative are the same as those described for the Proposed Action.

Other Sensitive Reptiles

The impacts on sensitive reptiles (chuckwalla and Mojave fringe-toed lizard) are expected to generally be the same as those described for the Proposed Action. The reduction in the area in the Modified Avawatz-Silurian Alternative may result in somewhat fewer impacts based on the elimination of potential habitat for these species in the areas south of the utility corridor and in the Silurian Hills. Eliminating local populations of these species within this alternative will occur. Because the impacts would not jeopardize the existence of the main populations in the immediate vicinity, impacts are not considered significant.

Raptors

The Modified Avawatz-Silurian Alternative will have a similar impact on sensitive raptor species as that described for the Proposed Action. The elimination of the area south of the utility corridor and the Silurian Hills will reduce the impacts.

Gila Woodpecker

The impacts on this species and other migratory birds are expected to be the same as those described for the Proposed Action (Section 4.5.1.1). Elimination of the Salt Creek ACEC from this alternative will decrease the area of potential habitat that is impacted by this alternative.

Other Sensitive Birds

The impacts on other sensitive birds are expected to be similar to those described for the Proposed Action (Section 4.5.1.1). Because the amount of habitat affected by this alternative is less than the Proposed Action, the impact will be less.

Sensitive Bats

Like the Proposed Action, the Modified Avawatz-Silurian Alternative will result in the loss of roosting sites for sensitive resident and migratory bat species. Eliminating the Silurian Hills and the Salt Creek ACEC from this alternative will decrease the impacts. This impact will be potentially significant but mitigated to nonsignificance with the avoidance of all springs, caves, and mineshafts by military personnel.

Badger

The impacts on badger habitat in the Modified Avawatz-Silurian Alternative are expected to be similar to those described for the Proposed Action (Section 4.5.1.1). The acreage of habitat potentially impacted

by this alternative will be less than the Proposed Action.

Nelson's Bighorn Sheep

The Modified Avawatz-Silurian Alternative will have the same impacts on Nelson's bighorn sheep as those described for the Proposed Action (Section 4.5.1.1).

4.5.2.2 Mitigation

General Vegetation

Mitigations for impacts on general vegetation are the same as those discussed for the Proposed Action (Section 4.5.1.2).

Sensitive Plants and Resources

Mitigations for impacts on sensitive plant species are the same as those discussed for the Proposed Action (Section 4.5.1.2).

General Wildlife

Mitigations for impacts on general wildlife are the same as those discussed for the Proposed Action (Section 4.5.1.2).

Sensitive Wildlife

Mitigations for impacts on sensitive wildlife are the same as those discussed for the Proposed Action (Section 4.5.1.2).

4.5.3 Modified Coyote Basin Alternative

4.5.3.1 Impacts

General Vegetation

This alternative will potentially impact up to 259,470 acres of native vegetation with the majority of impacts expected to occur in those areas (236,175 acres) of less than a 20-percent slope. Table 4.5-7 shows the plant community acreages for the Modified Coyote Basin Alternative. The primary communities impacted by this alternative are Mojave creosote scrub, Joshua tree woodland, desert saltbush scrub, and Mojave wash scrub. The types of impacts on vegetation that will result from the Modified Coyote Basin Alternative are similar to those previously discussed in the Proposed Action (Section 4.5.1.1). These impacts are discussed below with regard to general vegetation, sensitive species, and sensitive resources.

Staging Areas

The impacts from staging areas are expected to be similar to those described for the Proposed Action (Section 4.5.1.1). Because it is the largest and most contiguous community within the alternative, 185,113 acres of Mojave creosote scrub would most likely be impacted by the establishment of staging areas.

Access Routes to Staging Areas

Only existing dirt roads through the acquisition area will be used, and no new road construction is planned.

Trampling or Destruction of Vegetation

Battle Scenarios

The direct impacts from tracked and wheeled vehicles crushing vegetation and compacting soils while moving from the staging areas to the battle zones are expected to be significant. Based on the assumption that tracked and wheeled vehicles will operate in areas of less than 20 percent slope, the 185,113 acres of Mojave creosote bush scrub will most likely be impacted.

Foot Traffic

The impacts from foot traffic through the vegetation communities are expected to be similar to those described for the Proposed Action (Section 4.5.1.1). Trampling of vegetation by foot traffic will cause a direct impact on vegetation that occurs in areas where tanks will not travel but foot soldiers will. This includes areas with a slope of more than 20 percent. Communities that could potentially be impacted are 206,332 acres of Mojave creosote bush scrub, 5,818 acres of Mojave wash scrub, and 403 acres of alkali seep. These impacts could be substantial in and around staging areas and other high-use areas.

Table 4.5-7

POTENTIAL IMPACTS OF THE MODIFIED COYOTE BASIN ALTERNATIVE ON PLANT COMMUNITIES

Plant Community Type	Acres	Percent of All Acreage	Acres at <20% Slope	Percent of Community at <20% Slope
Mojave creosote bush scrub	206,332	79.5	185,113	90
Mojave creosote bush scrub/Joshua tree woodland mix	17,216	6.6	16,936	98
Mojave creosote bush scrub/desert saltbush scrub	0	0	0	0
Joshua tree woodland	0	0	0	0
Joshua tree woodland/Mojave woody scrub mix	741	0.3	741	100
Desert saltbush scrub	15,222	5.9	15,077	99
Desert sink scrub	3,954	1.5	3,954	100
Mojave mixed woody scrub	0	0	0	0
Crucifixion thorn woodland	1,005	0.4	528	53
Open playa or alkali playa	2,060	0.8	2,039	99
Mojave wash scrub	5,815	2.2	4,826	83
Freshwater seep or spring	439	0.2	439	100
Freshwater seep/Mojave wash scrub	0	0	0	0
Alkali seep	403	0.2	239	59
Saline hills	0	0	0	0
Stabilized and partially stabilized desert sand fields	0	0	0	0
Active sand dunes and dune/creosote bush scrub	0	0	0	0
Bursage scrub	0	0	0	0
Desert trumpet inclusion	0	0	0	0
Disturbed, no vegetation, dry lakebeds	6,283	2.4	6,283	100
TOTAL	**259,470**	**100**	**236,175**	**91***

* **Percent of total acres at <20 percent slope.**

Fires

Impacts on the vegetation communities from fires in the Modified Coyote Basin Alternative are the same as those discussed for the Proposed Action (Section 4.5.1.1).

Indirect Impacts

Erosion

Potential indirect impacts on vegetation communities from soil erosion in the Modified Coyote Basin Alternative are similar to those discussed for the Proposed Action (Section 4.5.1.1).

As discussed in the Proposed Action, increased dust from construction and maneuvering will not produce a significant impact on vegetation.

Sensitive Plants

One species, the Lane Mountain milkvetch, has been proposed as endangered by the USFWS. Implementation of the Modified Coyote Basin Alternative will result in loss of populations of this species and will impact five other sensitive species of plants.

The sensitive species described below will be impacted by this alternative.

At least 20 populations of the Lane Mountain milkvetch, a Federal Proposed Endangered Species, have been documented west of Fort Irwin Road within the western portion of this alternative (referred to as the Goldstone area). The Goldstone and Lane Mountain areas and the contiguous area on the NTC include the entire known existing and historic ranges of the species. Because the populations occurring in the alternative's area are scattered and appear to occur in relatively flat terrain, any activity in this area would impact this species. The impacts on the Lane Mountain milkvetch are potentially significant under this alternative because this species has not yet been listed by the USFWS.

Parish's Phacelia

Parish's phacelia occurs within the Modified Coyote Basin Alternative on a playa near the southern boundary. During the USFWS spring 1991 surveys, this population was found to have increased greatly in numbers, and the range had also expanded but not beyond the boundaries of the study area. The alternative could potentially eliminate this population. The loss of this population will be a significant impact at the state level because it is the only known occurrence remaining in California. This impact is mitigable by avoiding the population.

Three populations of the Mojave fishhook cactus, FSOC and a California Native Plant Society (CNPS) 1B species, have been documented in the Goldstone area of this alternative. This species was found on gravelly slopes and mesas in the creosote bush scrub. Implementation of this alternative would result in the loss of these three populations and in the loss of habitat for this species. This is considered less than significant.

Mojave Indigobush

The Mojave indigobush was identified in both the 1988 and 1989 field studies in sandy bajada washes near the northern border east of the Paradise Range and adjacent to the Parish's phacelia population in the southern portion of the alternative. Twenty-six populations of this species could potentially be impacted by this alternative. Implementation of the alternative could result in the elimination of several large populations (both with 1,000+ plants each) of this species occurring northwest of Jack Rabbit Springs, between the Paradise Mountain range and Jack Spring, and a large population of 800 to 1,200 plants scattered in the washes and alluvial slopes south of Coyote Lake. Available information about this species indicates that populations are still widespread enough that its loss from the project area will be less than significant.

Sand Linanthus

One large population of sand linanthus (between 100 to 200 plants) occurs in the northeast corner of the alternative, just north of the transmission lines. As with the Mojave indigobush, available information about this species indicates that populations are still widespread enough that its loss from the project area will be less than significant.

Crucifixion Thorn

A 1,005-acre area containing the crucifixion thorn is located in the eastern region of the alternative. The crucifixion thorn community is in an area that will be easily accessible to military vehicles. Although the crucifixion thorn is common in Arizona and is not a candidate for listing as endangered or threatened, this population represents an unusual range extension, and its loss will be considered significant at the state level. The impact is mitigable by restricting access to the area.

Alkali Mariposa Lily

A large number of alkali mariposa lilies have been documented within the alternative in the upper reaches of the Paradise Spring area. The alkali mariposa lily is an FSOC and a CNPS 1B Species. Any activity near the Paradise Spring area may have adverse impacts on these populations. These impacts are considered less than significant.

Potential Habitat for Other Sensitive Plant Species

The desert cymopterus, an FSOC and a CNPS List 1B species, was not encountered in the 1988, 1989, or 1995 surveys.

The Death Valley round-leaved phacelia, an FSOC and a CNPS List 1B Species, was not observed in 1988, 1989, or 1995 surveys. Based on the proximity of known populations in the Randsburg Wash to the Goldstone area, this alternative could potentially impact this species. Because this species was not found, the impact from the loss of potential habitat for this species is considered less than significant.

The small-flowered androstephium is known to occur in the Cronese Valley outside of the alternative's eastern boundary. Although considered to have potential to occur within the boundaries of the alternative, the species was not observed in the 1988, 1989, or 1995 field surveys. Due to the relatively low sensitivity of this species (considered by the CNPS as "rare or endangered in California but more common elsewhere"), the impact on this species, should it occur onsite, will represent only a small percentage of the total population. The impact will be less than significant.

Sensitive Resources

Springs

Disturbance of Artisan and Jack Rabbit Springs located on the northern rim of Coyote Lake and Jack Springs located east of the Paradise Range, along with the network of desert willows in Spanish Canyon that indicate watercourses in the Alvord Mountains, will cause significant direct and indirect impacts. Disturbance will constitute a significant but mitigable impact if the springs or water courses (indicated by willows) occur in the path of roads, staging areas, or battle scenarios. Indirect significant impacts from soil compaction could occur if these features neighbor the disturbance. Increases in water runoff from disturbed areas nearby will cause loss of soil nutrients and soil erosion in the feature's area and could negatively affect the health and integrity of the vegetation community.

General Wildlife

The impacts on general wildlife and wildlife habitat are expected to be similar to those described for the Proposed Action (Section 4.5.1.1). Implementation of the Modified Coyote Basin Alternative will result in the loss of or the heavy disturbance to 234,136 acres of the habitat found in parts of the Coyote Basin eastward into low-relief lands south of the Avawatz Mountains. This value excludes disturbed areas and dry lakebeds which are not considered wildlife habitat. This acreage is based on the amount of habitat occurring in areas of less than 20-percent slope (where the most intensive training activities will occur). Impacts on resident and migratory wildlife using habitats within this intensive impact area are considered significant.

As discussed under the Proposed Action (Section 4.5.1.1), the overall impacts on wildlife populations and activity patterns outside the heavy impact areas are considered less than significant.

The Modified Coyote Basin Alternative could potentially impact several areas considered critical for wildlife. These areas include Paradise Springs, Jack Springs, Jack Rabbit Springs, the slopes of the Alvord and Soda Mountains, and active dune systems in the vicinity of the Soda Mountains. These areas provide surface water, nesting sites, and otherwise critical habitat for resident and migratory wildlife. Although these sites generally fall outside the areas of maximal

vehicular disturbance, they are nonetheless susceptible to a variety of disturbances due to the placement of staging areas, observation posts, dust, noise, and off-course and scout vehicles and personnel. These impacts are considered significant.

Sensitive Wildlife

Desert Tortoise

Table 4.5-4 lists the area of each tortoise density category occurring within the boundaries of the alternatives. Implementation of this alternative will significantly impact resident desert tortoises within the project area. Table 4.5-5 lists the area of each tortoise density below 20-percent slope that will be impacted by this alternative. The highest concentrations of tortoises include the populations north and west of Alvord Mountain (the North Alvord Slope), southwest Coyote Basin, east of Lane Mountain, and west of the Cronese Mountains.

A Draft Biological Opinion on this alternative was issued by the USFWS in September 1991. The USFWS determined that implementation of the Modified Coyote Basin Alternative would jeopardize the future of the desert tortoise. As a result of that draft Jeopardy Opinion, the NTC developed the Proposed Action Alternative, which complied with a reasonable and prudent alternative suggested by the USFWS.

The impacts of military maneuvers on desert tortoise populations have been demonstrated by surveys conducted on the existing NTC. Within the maneuver areas, all tortoises and their habitat will eventually be lost where slopes are less than 20 percent. This direct impact will occur from tortoises and burrows being crushed as well as vegetation being destroyed. Although all tortoises will not be lost immediately, habitat will become so degraded that few tortoises will remain. This loss of habitat and tortoises will be considered permanent, considering the fragile nature of the desert landscape and the life history of tortoises. The Modified Coyote Basin Alternative encompasses approximately 236,175 acres of desert tortoise habitat.

Approximately 184,006 acres of designated critical habitat will be impacted by implementation of the Modified Coyote Basin Alternative. This represents a loss of approximately 4 percent of the critical habitat in California and a loss of 24 percent of the critical habitat in the Superior Cronese Unit.

In the 1990 cumulative impacts study on the desert tortoise (Chambers Group 1990b), an estimate was made of the amount of disturbance to desert tortoise habitat within the western Mojave Desert. Five categories of habitat conditions were assigned based on the amount of disturbances that occurred: irretrievable loss of habitat for the foreseeable future, serious habitat damage, moderate to heavy disturbance, light to moderate disturbance, and least disturbed. Within the Modified Coyote Basin Alternative, approximately 0 acres of irretrievably lost habitat, approximately 12,544 acres of seriously damaged habitat, approximately 124,544 acres of moderate to heavily disturbed habitat, approximately 129,408 acres of light to moderately disturbed habitat, and approximately 61,824 acres of least disturbed habitat are encompassed by the boundaries.

As in the Proposed Action, implementation of the Modified Coyote Basin Alternative will result in a number of indirect impacts on areas surrounding the expansion area. One indirect impact that currently exists at Fort Irwin will be an increase in the sink effect caused by roads and maneuver areas. Implementation of the proposed Modified Coyote Basin Alternative will result in an increase in the sink effect if no conservation measures are undertaken. Fort Irwin Road is currently a sink area because of the high degree of traffic on the road.

As in the Proposed Action, areas adjacent to the new boundaries might be subjected to increased noise, dust, emissions, and sand dune formation (from blown sand generated in the maneuver areas). In addition, military activities have the potential to generate trash, which could possibly result in the attraction of additional ravens to the expansion area and adjacent tortoise habitats. These indirect impacts will be considered significant.

Indirect impacts in the form of isolation of tortoises from larger, contiguous tortoise populations will occur as a result of the proposed expansion. The area south and southeast of the proposed expansion area, between the I-15 and the proposed expansion area, will be isolated from other tortoise populations. The northern boundary of this isolated area will be fenced, which will preclude any movement of tortoises into maneuver areas. The southern boundary of the isolated area is the I-15, which currently constitutes a tortoise sink. Tortoise density surveys conducted in 1990 showed that the density of tortoises within the isolation area is low and their distribution is patchy. Approximately 5,056 acres of habitat contain 1 to 19 tortoises/square

mile, and approximately 1,728 acres of habitat contain 20 to 49 tortoises/square mile (1 square mile = 640 acres). The remainder of the isolation area contains approximately 52,800 acres of habitat that were surveyed but exhibited zero sign per square mile. In addition, approximately 44,928 acres of unsuitable habitat (mountains and dry lakebeds) also occur within the isolation area. The tortoises in the isolation area will be able to come into contact with other tortoise populations located west of the isolation area, but they will be isolated from populations within the boundary of the proposed expansion.

The tortoise population located north of the boundary of the proposed expansion area, adjacent to the Alvord Mountains, is located within the boundaries of Fort Irwin. Indirect impacts resulting from the proposed land acquisition will be similar to those mentioned for the isolation area. The tortoises will be isolated from other contiguous populations of tortoise by the presence of fences and maneuver areas.

Mohave Ground Squirrel

The Mohave ground squirrel was not observed in the project area during the surveys; however, potential habitat for the Mohave ground squirrel exists in the western portion of the alternative (east to the Paradise Range and Coyote Lake). Approximately 3,840 acres of potential Mohave ground squirrel crucial habitat will be included within this alternative. This loss of potential habitat constitutes a significant impact.

Other Sensitive Reptiles

The impacts on the chuckwalla and Mojave fringe-toed lizard populations onsite are expected to be similar to those described for the Proposed Action (Section 4.5.1.1).

Raptors

The impacts on raptors are expected to be similar to those described for the Proposed Action (Section 4.5.1.1).

Other Sensitive Birds

The impacts on other sensitive bird species are expected to be the same as those described for the Proposed Action (Section 4.5.1.1).

Sensitive Bats

Impacts on sensitive bats will be similar to those stated for the Proposed Action (Section 4.5.1.1). Human disturbance in areas, such as Paradise Springs, will eliminate critical water resources required of all bat species. This impact is potentially significant but mitigated to nonsignificance due to continued avoidance of all springs, caves, and mineshafts by military personnel.

Badger

As in the Proposed Action (Section 4.5.1.1), impacts will occur to any potential or existing badger habitat onsite. Because this species lacks formal protection, this impact is considered less than significant.

Nelson's Bighorn Sheep

Implementation of this alternative will impact potential movement corridors of the Nelson's bighorn sheep population known to occur in the Avawatz Mountains. Increased disturbance from human activity in the Avawatz Mountains will result in the loss or long-term disruption of the movement corridors established by Nelson's bighorn sheep to reach other populations and critical resources in adjacent mountain ranges. This impact is considered significant.

4.5.3.2 Mitigation

General Vegetation

Mitigations for impacts on general vegetation are the same as those discussed under the Proposed Action (Section 4.5.1.2).

Sensitive Plants

Significant impacts on known populations of sensitive species in the alternative's area can be mitigated by taking the following measures:

15. Access to the areas containing Parish's phacelia, located less than 1 mile from the alternative's southern boundary, shall be restricted. These areas shall be off limits to military vehicles.

16. If the Lane Mountain milkvetch is listed prior to implementation of the land acquisition project, then appropriate measures shall be undertaken to protect the populations of this species. In the event that it is listed, the NTC shall consult with the USFWS to develop these measures. If this species is not listed, then the populations shall be avoided to the extent possible and seeds shall be collected and seeded in other suitable habitat areas that will not be impacted by maneuvers.

17. Access to the springs shall be restricted to minimize impacts to the sensitive plants species that occur in those areas.

18. Access to the area containing the crucifixion thorn woodland shall be restricted. The area shall be cordoned off with fencing and posted signs. A buffer zone around the crucifixion thorn woodland shall be established in consultation with the appropriate resource agency.

Sensitive Resources

19. Access to the Paradise, Artisan, Jack, and Jack Rabbit Springs shall be restricted. The areas shall be placed off limits to military vehicles.

20. Access to the 5 square miles (3,200 acres) of saturated soils associated with Jack Rabbit Springs shall be restricted. The area shall be placed off limits to military vehicles.

21. Vehicular access to Spanish Canyon in the Alvord Mountains shall be restricted to designated existing routes. Erosion control methods shall be used to slow erosion caused by increased vehicular/tank traffic.

General Wildlife

22. Access to the Paradise and Jack Rabbit Springs shall be put off limits.

23. In areas of greater than 20-percent slope, all vehicles and personnel shall remain out of established washes, except to cross the wash.

24. All base operations shall remain at least 1/4 mile from raptor nesting sites, such as cliff faces, when possible.

Sensitive Wildlife

Mitigations for impacts on sensitive wildlife are the same as those discussed under the Proposed Action (Section 4.5.1.2). The following mitigation measures apply to the desert tortoise.

Desert Tortoise

25. Where necessary, tortoise-proof fencing of a USFWS-approved design shall be installed to preclude tortoise ingress into the maneuver areas (see Figure 4.5-2). Placement of tortoise-proof fencing shall be guided by the NTC biologist and approved by the USFWS. The NTC biologist shall also evaluate any proposed changes in the fence placement, as well as make any additional requests for changes in fencing. The integrity of the fences shall be monitored with frequent patrols by resident biologists; a complete inspection shall be conducted immediately after every rotation.

    In an attempt to preserve those higher density populations occurring completely or partially within the heavy maneuvering areas, tortoise-proof fencing will be constructed. The highest density populations are located on the Northwest Alvord Slope. The fencing will be placed in such a way as to prevent tortoises from entering maneuver sinks.

    The west side of Fort Irwin Road will be fenced (approximately 4 miles) to eliminate the sink effect caused by heavy use of the road. Tortoise-proof fencing (approximately 4 miles) will be used in conjunction with barrier fencing similar to that used on State Highway 58 between Barstow and Edwards AFB. The

tortoise-proof fencing will be the standard type acceptable to the USFWS. The integrity of the fence will be monitored by the resident tortoise biologists.

The U.S. Army will coordinate with Caltrans and the County of San Bernardino road department to acquire a fencing easement (if construction occurs prior to withdrawal). Any additional ingress/egress points will be established as necessary during this time.

26. The NTC will relocate tortoises from four areas with tortoise densities of 51 to 100 tortoises per square mile that are located within the proposed acquisition area but outside of the fenced removal areas. These areas encompass approximately 36 square miles.

Once the proposed land acquisition is approved, Army personnel will initiate sweeps for tortoises prior to the beginning of any maneuvers. Tortoises will be removed from these high-density areas and relocated to other parts of the western Mojave Desert.

The NTC will also implement a phased removal of tortoises from two areas shown on Figure 4.5-3. These areas encompass approximately 36 square miles. They will be fenced with barrier fence and placed off limits to maneuver exercises until tortoises are removed. As sections are cleared, portions of the fencing could be removed for future maneuver exercises. These tortoises will be relocated into other areas in the western Mojave Desert. These specific areas for relocation will be coordinated with the USFWS, CDFG, BLM, and other resource agencies as necessary.

The removal of tortoises from these protected areas will not occur until the sweeps for tortoises have been completed in the maneuver areas. The rate of removal from these protected areas is expected to be lower than that from the maneuver areas and will be conducted on an as-needed basis dictated by military mission or research need. The technique for tortoise removal and relocation will be the same as that described below for the maneuver areas.

The sweeps to remove tortoises from maneuver areas within the expansion will be initiated after approval of the NTC expansion. Army personnel will assist trained biologists with sweeping areas of high tortoise densities (51 to 100 tortoises/square mile). Sweeps of tortoises for removal will occur in the spring when tortoises are most active and the likelihood of encounter is the greatest. Additional lower intensity sweeps will continue during low-activity times, such as summer and fall, relying more heavily on burrow inspection using fiber-optic scopes to locate inactive tortoises. Sweeps will continue until the capture rate falls below the acceptable level established by the USFWS. Potentially gravid female tortoises collected near the time of ovipositioning will be closely monitored following relocation to ensure that eggs have been properly deposited in burrows. These clutches will be monitored to assess hatching success. Some of the located gravid females may be used in hatchling success studies. Monitoring tortoises at the release sites will continue on each location for a minimum of 3 years. Tortoise-spotting sweeps will be made every 2 weeks for the first 2 months following the release, twice the following spring, and once during the third spring.

The NTC will coordinate with the USFWS, CDFG, and the BLM to refine the research relocation efforts and management of tortoises in these areas, and modify the plan as necessary. The relocation studies and reports will be formally reviewed by the NTC biologist and the USFWS annually, and modifications will be proposed for the following year.

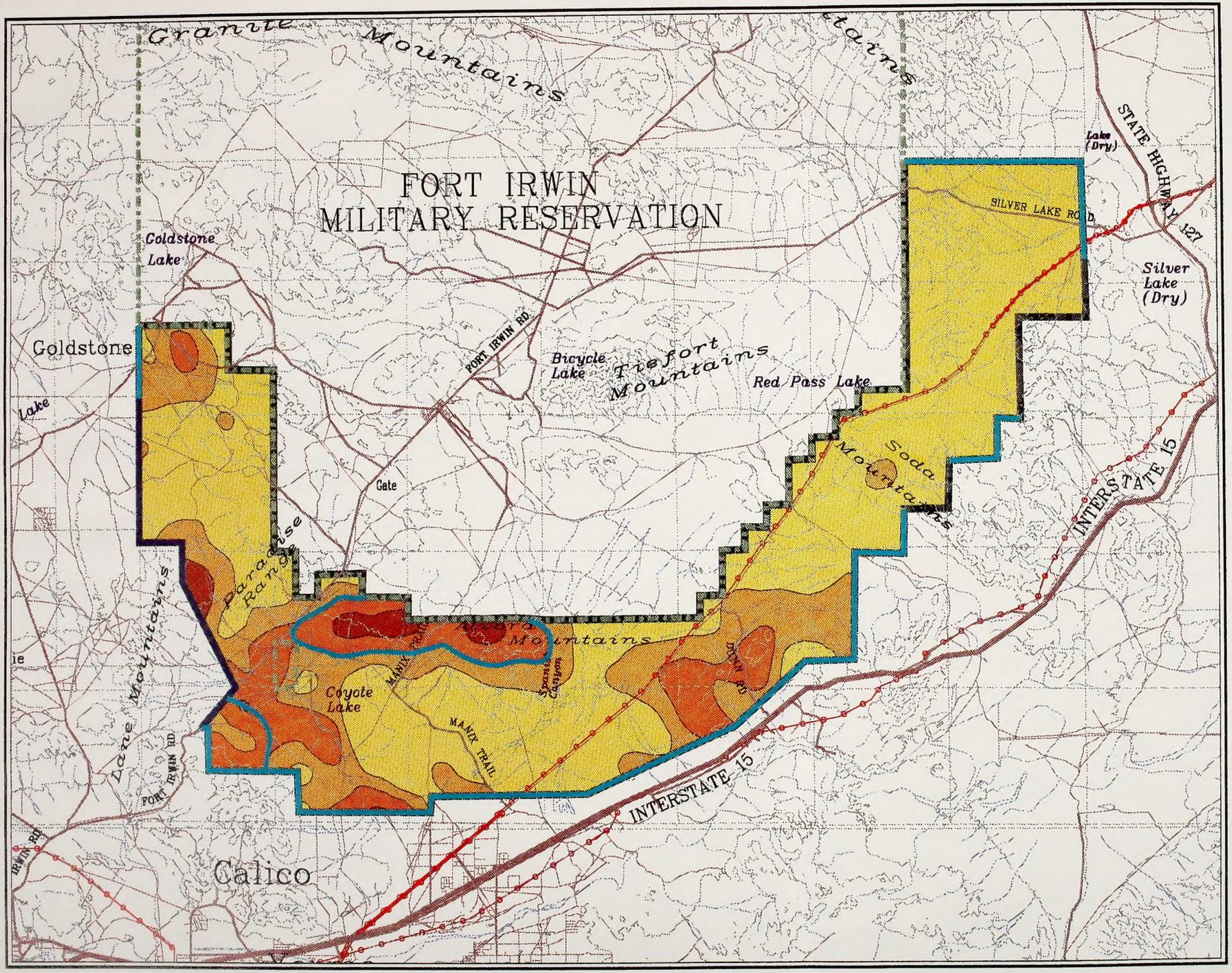
Education

Description

As described previously under the Proposed Action, on-post education currently provided to soldiers will be expanded, and education provided to family members and rotational units will continue with more emphasis being placed on awareness of the desert tortoise and its habitat.

Mohave Ground Squirrel

27. The Mohave ground squirrel habitat shall be placed off limits and avoided.



Explanation

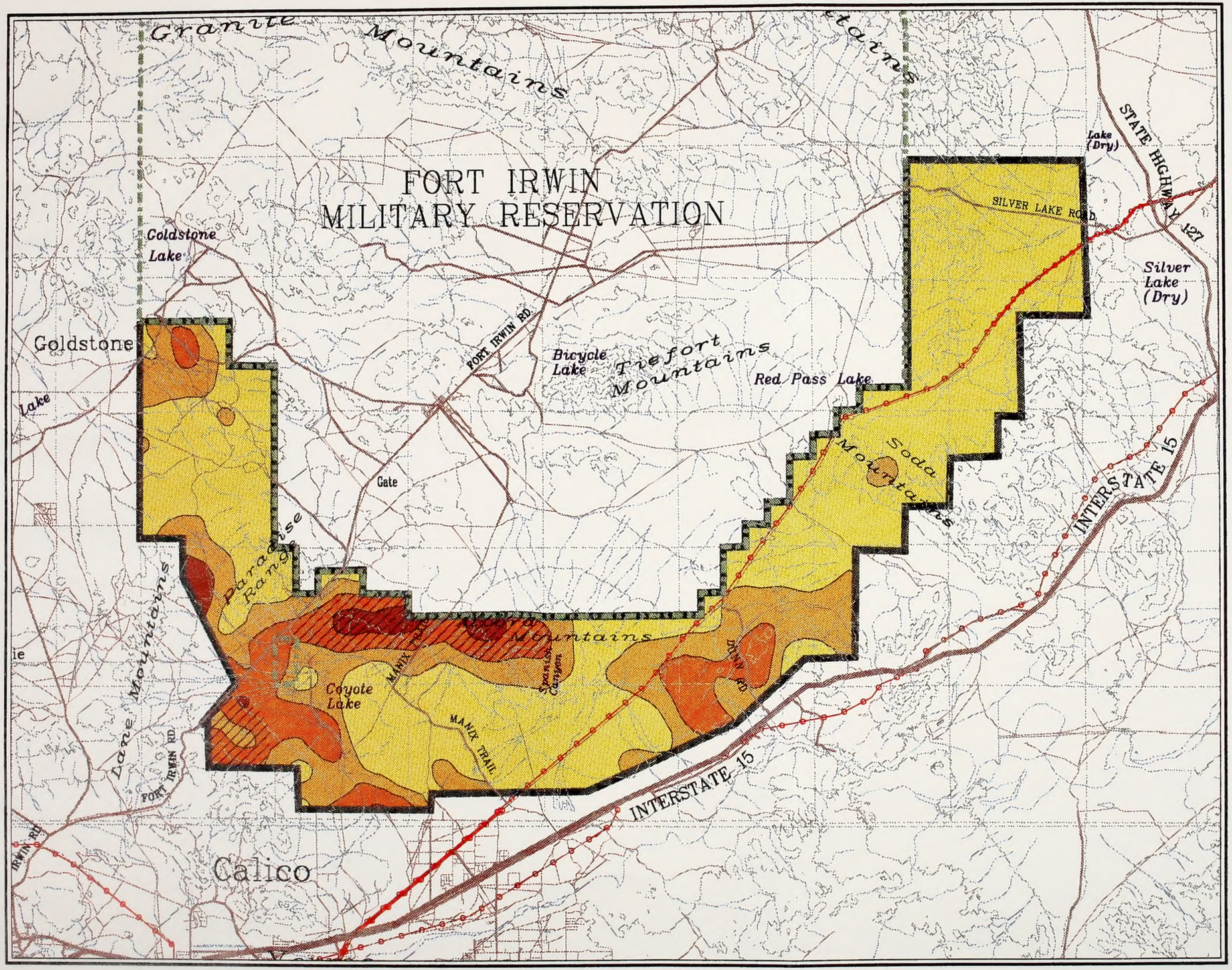
- 0-19 Tortoises per Square Mile
- 20-49 Tortoises per Square Mile
- 50-99 Tortoises per Square Mile
- 100-249 Tortoises per Square Mile
- Proposed Tortoise-Proof and Barrier Fence
- Proposed Barrier Fence
- Power/Transmission Lines

(1 square mile = 640 acres)

Modified Coyote Basin Alternative
LOCATION OF FENCE TYPES
Figure 4.5-2

Chambers Group, Inc.
4 2 1 0 4 Miles
1" = 25000'
Project# 6347
December 03, 1996

December 03, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml



Explanation

- 0-19 Tortoises per Square Mile
- 20-49 Tortoises per Square Mile
- 50-99 Tortoises per Square Mile
- 100-249 Tortoises per Square Mile
- Proposed Tortoise Removal Areas (for Relocation)
- Power/Transmission Lines

(1 square mile = 640 acres)

Modified Coyote Basin Alternative
PROPOSED TORTOISE REMOVAL AREAS
Figure 4.5-3

Chambers Group, Inc.
4 2 1 0 4 Miles
1" = 25000'
Project# 6347
December 03, 1996

December 03, 1996 - /gis1/plots/6347_ftirwin/plots/plot.aml

4.5.4 Alvord Alternative

4.5.4.1 Impacts

General Vegetation

This alternative will potentially impact up to 210,800 acres of relatively undisturbed native vegetation, predominantly Mojave creosote bush scrub and Mojave creosote scrub/Joshua tree woodland mix. Most of the impacts would be expected to occur in areas (190,727 acres) of less than 20-percent slope. The plant communities occurring within the Alvord Alternative are Mojave creosote bush scrub, Mojave creosote bush scrub/Joshua tree woodland mix, Joshua tree woodland/Mojave woody scrub mix, desert saltbush scrub, desert sink scrub, crucifixion thorn woodland, open or alkali playa, Mojave wash scrub, freshwater spring, and alkali seep (Table 4.5-8). These plant communities will be subjected to the impacts as discussed for the Modified Coyote Basin Alternative (Section 4.5.3.1), with the exception of those areas adjacent to Fort Irwin Road that are not part of the Alvord Alternative.

This includes approximately 172,323 acres of relatively undisturbed Mojave creosote scrub, 17,168 acres of Mojave creosote scrub/Joshua tree woodland mix, 767 acres of Joshua tree woodland/Mojave woody scrub mix, and 10,411 acres of desert saltbush scrub.

As discussed in the Modified Coyote Basin Alternative (Section 4.5.3.1), the most serious impacts will be from the large-scale loss of Mojave creosote scrub or Mojave creosote scrub/Joshua tree woodland mix because of their slow recovery rate and importance as wildlife habitat.

Direct and indirect impacts on the remaining plant communities from this activity are the same as those discussed for the Modified Coyote Basin Alternative (Section 4.5.3.1).

Sensitive Plants

Implementation of the Alvord Alternative will result in similar impacts on sensitive species (Table 4.5-2) and their potential habitat as those discussed for the Modified Coyote Basin Alternative (Section 4.5.3.1). The impacts on the sand linanthus and the small-flowered androstephium are expected to be the same as those described for the Modified Coyote Basin Alternative. However, the Alvord Alternative excludes some of the populations of Mojave indigobush and alkali mariposa lily occurring in areas adjacent to Fort Irwin Road.

Parish's Phacelia

Implementation of this alternative will result in the same impacts on the Parish's phacelia as those described for the Modified Coyote Basin Alternative (Section 4.5.3.1).

Lane Mountain Milkvetch

The impacts on the Lane Mountain milkvetch are the same as those described for the Modified Coyote Basin Alternative (Section 4.5.3.1) with the exception of one population that lies outside of the boundaries of the Alvord Alternative.

Mojave Indigobush

Eight scattered populations of the Mojave indigobush located in the Goldstone area will be impacted by this alternative. The large populations near Jack Rabbit Springs and southeast of Coyote Lake will not be impacted by this alternative. Available information about this species indicates that populations are still widespread enough that its loss from the project area will be less than significant.

Mojave Fishhook Cactus

Populations of Mojave fishhook cactus (FSOC) have been documented in the Goldstone portion of this alternative. The Mojave fishhook cactus was found on gravelly slopes and mesas in creosote bush scrub. Implementation of this alternative would impact these populations and potential habitat for this species.

Sensitive Resources

Impacts on springs and desert willow habitat in Spanish Canyon are the same as those discussed under the Modified Coyote Basin Alternative (Section 4.5.3.1). Paradise Spring will not be impacted by implementation of the Alvord Alternative because it is located outside of the boundaries.

Table 4.5-8

POTENTIAL IMPACTS OF THE ALVORD ALTERNATIVE ON PLANT COMMUNITIES

Plant Community Type	Acres	Percent of Total Acreage	Acres at <20% Slope	Percent of Community at <20% Slope
Mojave creosote bush scrub	172,323	82	154,130	89
Mojave creosote bush scrub/Joshua tree woodland mix	17,168	8	16,892	98
Mojave creosote bush scrub/desert saltbush scrub	0	0	0	0
Joshua tree woodland	0	0	0	0
Joshua tree woodland/Mojave woody scrub mix	767	0.3	767	0
Desert saltbush scrub	10,411	5	10,267	99
Desert sink scrub	942	0.4	942	100
Mojave mixed woody scrub	0	0	0	0
Crucifixion thorn woodland	997	0.5	524	52
Open playa or alkali playa	2,212	1	2,193	99
Mojave wash scrub	5,716	2.7	4,748	83
Freshwater seep or spring	44	<0.1	44	100
Freshwater seep/Mojave wash scrub	0	0	0	0
Alkali seep	220	0.1	220	100
Saline hills	0	0	0	0
Stabilized and partially stabilized desert sand fields	0	0	0	0
Active sand dunes and dune/creosote bush scrub	0	0	0	0
Bursage scrub	0	0	0	0
Desert trumpet inclusion	0	0	0	0
Disturbed, no vegetation, dry lakebeds	0	0	0	0
TOTAL	**210,800**	**100**	**190,727**	**90***

*** Percent of total acres at <20 percent slope.**

General Wildlife

The impacts associated with this alternative are similar to those described for the Modified Coyote Basin Alternative. However, because this alternative does not include the habitats west of Coyote Lake, they are somewhat reduced in extent. A total of 190,727 acres of wildlife habitat will be impacted in the heavy maneuvering areas (less than 20-percent slope). This impact is considered significant. The Alvord Alternative does not include sensitive wildlife resource areas, such as the Paradise and Jackrabbit Springs, although these sites lie within 2 miles of proposed maneuvering areas.

Sensitive Wildlife

Desert Tortoise

The impacts of the Alvord Alternative are expected to be similar to those described for the Modified Coyote Basin Alternative (Section 4.5.3.1). The smaller size of the Alvord Alternative eliminates impacts to some of the higher density tortoise habitat to the east of Fort Irwin Road. Table 4.5-4 lists the area of each tortoise density category occurring within the boundaries of this alternative. The proposed alternative will significantly impact resident desert tortoises within the project area.

Maneuvers in areas below 20-percent slope will impact 137,643 acres of 0 to 19/square-mile tortoise density habitat, 34,776 acres of 20 to 49/square-mile tortoise density habitat, 15,277 acres of 50 to 99/square-mile tortoise density habitat, and 2,796 acres of 100 to 250/square-mile tortoise density habitat. The nature of the direct and indirect impacts on desert tortoises with this alternative will be similar to that for the Modified Coyote Basin Alternative.

Approximately 135,300 acres of designated critical habitat will be impacted by implementation of the Alvord Alternative. This represents a loss of approximately 3 percent of the critical habitat in California and approximately 18 percent of the critical habitat within the Superior-Cronese unit.

Mohave Ground Squirrel

A total of 2,950 acres of BLM-designated Mohave ground squirrel habitat will be impacted with this alternative. This impact is considered significant.

Other Sensitive Wildlife

Impacts on other sensitive wildlife with this alternative will be similar to those described for the Modified Coyote Basin Alternative (Section 4.5.3.1). Exceptions include a lessening of impacts on sensitive raptors using the Paradise Range and Paradise Spring and elimination of direct impacts on sensitive wildlife west of Fort Irwin Road and east of Lane Mountain.

4.5.4.2 Mitigation

General Vegetation

Mitigations for impacts on general vegetation from actions on the alternative are the same as Mitigation Nos. 1 and 2 discussed under the Proposed Action (Section 4.5.1.2).

Sensitive Plants

Mitigation Nos. 15 through 18 under the Modified Coyote Basin Alternative (Section 4.5.3.2) shall be implemented to protect sensitive plant species occurring within the boundaries of this alternative.

Sensitive Resources

The mitigations for protecting springs are the same as those under the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 19 through 21).

General Wildlife

Mitigation measures for general wildlife are similar to those for the Modified Coyote Basin Alternative (Section 4.5.3.2) with the exception of measures to protect Paradise Spring since it is not within the boundary of this alternative.

Sensitive Wildlife

Desert Tortoise

The mitigation measures for the Alvord Alternative are similar to those for the Modified Coyote Basin Alternative (Section 4.5.3.2), with several exceptions. Fort Irwin Road will not be fenced, and the Army will not acquire a fencing easement for Fort Irwin Road (as

stated in Mitigation No. 25). In addition, the Army will not relocate tortoises from the areas outside of the boundaries of the Alvord Alternative (as stated in Mitigation No. 26).

Mohave Ground Squirrel

Mitigations for the Mohave ground squirrel habitat are the same as those described for the Modified Coyote Basin Alternative (Section 4.5.3.2).

Other Sensitive Wildlife

Mitigation measures for this alternative are similar to those proposed for the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 22 through 24), except that Paradise Spring will not be impacted by this alternative.

4.5.5 Superior Valley Alternative

4.5.5.1 Impacts

General Vegetation

This alternative will potentially impact up to 284,885 acres of relatively undisturbed native vegetation (predominantly Mojave creosote bush scrub but with substantial inclusions [over 49,188 acres] of Joshua tree woodlands), with the majority of impacts expected to occur in those areas (264,776 acres) of less than 20-percent slope (Table 4.5-9). All major plant communities found within the study area, except crucifixion thorn woodland, are represented within this alternative and will be subjected to the impacts as discussed in the Modified Coyote Basin Alternative (Section 4.5.3.1).

The majority of significant direct impacts from damaging vegetation is expected to occur in those areas of less than 20-percent slope. This alternative could lead to the elimination of more than twice the amount of the Joshua tree woodland (4,376 acres) as any other alternative.

The other plant communities that occur in areas of less than 20-percent slope within this alternative include approximately 166,693 acres of relatively undisturbed Mojave creosote scrub, 32,987 acres of Mojave creosote scrub/Joshua tree woodland mix, 13,272 acres of desert saltbush scrub, 3,810 acres desert sink scrub, 4,066 acres of Mojave wash scrub, 686 acres of open playa, and 230 acres of alkali seep. As discussed in the Modified Coyote Basin Alternative (Section 4.5.3.1), the most serious impacts will be from the large-scale loss of Mojave creosote scrub, Joshua tree woodland, or Mojave creosote scrub/ Joshua tree woodland mix. These impacts are only partially mitigable. These impacts are considered significant.

Impacts on vegetation from trampling by foot and light vehicle traffic, fire, and indirect impacts from erosion and dust are identical to those discussed in the Modified Coyote Basin Alternative (Section 4.5.3.1).

Sensitive Plants

Impacts from activity in the Superior Valley Alternative on sensitive plant species are similar to those discussed under the Modified Coyote Basin Alternative (Section 4.5.3.1).

Barstow Woolly Sunflower

The Barstow woolly sunflower, an FSOC and a CNPS List 1B Species, is an annual species that only appears in favorable years. One population of this species was found on Coolgardie Mesa on the east side of a road that connects to the Copper City Road west of Lane Mountain (USFWS 1991b). Selection and implementation of the Superior Valley Alternative will probably eliminate the Barstow woolly sunflower population in the acquisition study area unless a mitigation plan is developed. Loss of this population will be a significant impact on the species because so few populations of the Barstow woolly sunflower exist. The impact of the loss of this population will also be significant because the eastern and attitudinal ranges will also be reduced.

Lane Mountain Milkvetch

The impacts on the Lane Mountain milkvetch are the same as those described under the Modified Coyote Basin Alternative (Section 4.5.3.1). The 20 populations west of Fort Irwin Road would potentially be significantly impacted by this alternative.

Table 4.5-9

POTENTIAL IMPACTS OF THE SUPERIOR VALLEY ALTERNATIVE ON PLANT COMMUNITIES

Plant Community Type	Acres	Percent of Total Acreage	Acres at <20% Slope	Percent of Community at <20% Slope
Mojave creosote bush scrub	183,338	64	166,693	91
Mojave creosote bush scrub/Joshua tree woodland mix	33,950	12	32,987	97
Mojave creosote bush scrub/desert saltbush scrub	0	0	0	0
Joshua tree woodland	4,822	2	4,376	91
Joshua tree woodland/Mojave woody scrub mix	10,416	3.6	10,400	99
Desert saltbush scrub	13,412	5	13,272	99
Desert sink scrub	3,810	1	3,810	100
Mojave mixed woody scrub	4,923	2	4,450	90
Crucifixion thorn woodland	0	0	0	0
Open playa or alkali playa	733	0.2	686	93
Mojave wash scrub	4,877	2	4,066	83
Freshwater seep or spring	422	0.1	422	100
Freshwater seep/Mojave wash scrub	0	0	0	0
Alkali seep	389	0.1	230	59
Saline hills	0	0	0	0
Stabilized and partially stabilized desert sand fields	0	0	0	0
Active sand dunes and dune/creosote bush scrub	0	0	0	0
Bursage scrub	0	0	0	0
Desert trumpet inclusion	0	0	0	0
Disturbed, no vegetation, dry lakebeds	23,793	8	23,384	98
TOTAL	**284,885**	**100**	**264,776**	**93***

*** Percent of total acres at <20 percent slope.**

Mojave Indigobush

At least 34 populations of the Mojave indigobush have been identified within the boundary of this alternative. Implementation of this alternative will result in the elimination of these populations. Available information about this species indicates that populations are still widespread enough that its loss from the project area will not be significant.

Mojave Fishhook Cactus

Eleven populations of Mojave fishhook cactus have been documented in the Goldstone area within the boundary of this alternative. Implementation of this alternative would impact these populations and would result in the loss of potential habitat for this species. This impact is considered less than significant.

Alkali Mariposa Lily

Implementation of the Superior Valley Alternative would result in the same impacts on the alkali mariposa lily as the Modified Coyote Basin Alternative (Section 4.5.3.1).

Other Sensitive Species

The crucifixion thorn does not occur within this alternative's boundaries and therefore will not be impacted.

Potential habitat for sand linanthus and the Parish's phacelia will be impacted by activity in the alternative's area. The potential impacts are described under the Modified Coyote Basin Alternative (Section 4.5.3.1).

Sensitive Resources

All four named springs, a suite of unnamed springs in the Paradise Range, and the network of desert willows located in Spanish Canyon in the Alvord Mountains will be significantly impacted, both directly and indirectly, by this alternative.

General Wildlife

In general, the impacts on wildlife habitat are similar to those described for the Proposed Action (Section 4.5.1.1). The Superior Valley Alternative will result in the loss of or the heavy disturbance to 241,392 acres of the habitat found in parts of the Coyote Basin eastward into low relief lands south of the Avawatz Mountains.

Sensitive Wildlife

Desert Tortoise

Table 4.5-4 lists the areas of each tortoise density category occurring within this alternative. The Superior Valley Alternative will significantly impact resident desert tortoises within the project area. Tortoises occurring in the heavy impact areas of less than 20-percent slope and their habitats will be severely impacted. The highest concentrations of tortoises include the populations in the Superior Valley and west of the Cronese Mountains. This alternative avoids the high tortoise concentrations in the North Alvord Slope region.

Maneuvers in areas of less than 20-percent slope will impact 137,904 acres of 0 to 19/square-mile tortoise density habitat, 76,684 acres of 20 to 49/square-mile tortoise density habitat, 40,417 acres of 50 to 99/square-mile tortoise density habitat, and 9,223 acres of 100 to 250/square-mile tortoise density habitat. The nature of the direct and indirect impacts on desert tortoises with this alternative will be similar to that for the Modified Coyote Basin Alternative (Section 4.5.3.1).

Approximately 253,002 acres of designated critical habitat will be impacted by implementation of the Superior Valley Alternative. This represents a loss of approximately 5 percent of the critical habitat in California and approximately 33 percent of the critical habitat in the Superior-Cronese unit.

Mohave Ground Squirrel

Approximately 11,002 acres of BLM-designated Mohave ground squirrel crucial habitat will be impacted with this alternative. This impact is considered significant.

Other Sensitive Wildlife

Impacts on other sensitive wildlife with this alternative will be similar to those described for the Proposed Action (Section 4.5.1.1) and the Modified Coyote Basin Alternative (Section 4.5.3.1).

4.5.5.2 Mitigation

General Vegetation

Mitigations for impacts on general vegetation and sensitive features, such as springs and desert willow habitats, are similar to those discussed under the Proposed Action (Section 4.5.1.2).

Sensitive Plants

Mitigations for impacts on sensitive plant species and potential habitat for sensitive species are similar to those discussed under the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 15 through 17), with the addition of the following:

28. Areas supporting the populations of the Barstow woolly sunflower shall be placed off limits and avoided.

Sensitive Resources

Impacts on springs and other sensitive resources shall be mitigated by implementing Mitigation Nos. 19 through 21 as discussed under the Modified Coyote Basin Alternative (Section 4.5.3.2).

General Wildlife

Mitigation measures for general wildlife are Nos. 4 and 5 under the Proposed Action (Section 4.5.1.2) and Nos. 22 through 24 under the Modified Coyote Basin Alternative (Section 4.5.3.2).

Sensitive Wildlife

Desert Tortoise

The mitigation measures for the Superior Valley Alternative are the same as those discussed for the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 25 and 26).

Mohave Ground Squirrel

Mitigations for the Mohave ground squirrel are the same as those described for the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation No. 27).

Other Sensitive Wildlife

Mitigation measures for this alternative are similar to those described for the Proposed Action (Section 4.5.1.1, Mitigation Nos. 13 and 14).

4.5.6 Avawatz Alternative

4.5.6.1 Impacts

General Vegetation

Implementation of the Avawatz Alternative is expected to have similar impacts to those described for the Modified Coyote Basin Alternative (Section 4.5.3.1). This alternative could potentially impact up to 185,500 acres of relatively undisturbed native vegetation. All the plant communities found within the study area are represented within this alternative, except Joshua tree woodland, Mojave mixed woody scrub, saline hills, stabilized and partially stabilized sand fields, active sand dunes, and the crucifixion thorn woodland (Table 4.5-10). The vegetation in the Avawatz Alternative will be subjected to the direct and indirect impacts as discussed under the Modified Coyote Basin Alternative (Section 4.5.3.1).

The majority of significant direct impacts from damaging vegetation is expected to occur in those areas (170,401 acres) of less than 20-percent slope. This alternative could lead to the disturbance of 16,905 acres of Mojave creosote bush scrub/Joshua tree woodland mix and 770 acres of Joshua tree woodland/Mojave woody scrub mix.

The other plant communities that could be impacted include approximately 124,241 acres of relatively undisturbed Mojave creosote scrub, 13,062 acres of desert saltbush scrub, 3,923 acres of desert sink scrub, 4,185 acres of Mojave wash scrub, 293 acres of open playa, and over 237 acres of alkali seeps (with meadows) or freshwater springs. As discussed in the

Table 4.5-10

POTENTIAL IMPACTS OF THE AVAWATZ ALTERNATIVE ON PLANT COMMUNITIES

Plant Community Type	Acres	Percent of Total Acreage	Acres at <20% Slope	Percent of Community at <20% Slope
Mojave creosote bush scrub	137,903	74	124,241	90
Mojave creosote bush scrub/Joshua tree woodland mix	17,189	9	16,905	98
Mojave creosote bush scrub/desert saltbush scrub	0	0	0	0
Joshua tree woodland	0	0	0	0
Joshua tree woodland/Mojave woody scrub mix	770	0.4	770	100
Desert saltbush scrub	13,212	7	13,062	99
Desert sink scrub	3,923	2	3,923	100
Mojave mixed woody scrub	0	0	0	0
Crucifixion thorn woodland	0	0	0	0
Open playa or alkali playa	293	0.2	293	100
Mojave wash scrub	5,022	3	4,185	83
Freshwater seep or spring	434	0.2	434	100
Freshwater seep/Mojave wash scrub	0	0	0	0
Alkali seep	401	0.2	237	59
Saline hills	0	0	0	0
Stabilized and partially stabilized desert sand fields	0	0	0	0
Active sand dunes and dune/creosote bush scrub	0	0	0	0
Bursage scrub	0	0	0	0
Desert trumpet inclusion	0	0	0	0
Disturbed, no vegetation, dry lakebeds	6,353	4	6,353	100
TOTAL	**185,500**	**100**	**170,401**	**92***

* **Percent of total acres at <20 percent slope.**

Modified Coyote Basin Alternative (Section 4.5.3.1), the most serious impacts will be from the large-scale loss of Mojave creosote scrub, Mojave creosote scrub/Joshua tree woodland mix, and Joshua tree woodland/Mojave woody scrub mix.

Sensitive Plants

Impacts on sensitive species and potential habitat for sensitive species are similar to those discussed in the Modified Coyote Basin Alternative (Section 4.5.3.1).

Sensitive Resources

As discussed in the Modified Coyote Basin Alternative (Section 4.5.3.1), all four named springs, the suite of unnamed springs in the Paradise Range, and the network of desert willows located in Spanish Canyon the Alvord Mountains will be significantly impacted, both directly and indirectly, by this action.

General Wildlife

Implementation of the Avawatz Alternative is expected to have impacts similar to those described for the Modified Coyote Basin Alternative (Section 4.5.3.1). The Avawatz Alternative will result in the loss of or the heavy disturbance to 164,048 acres of the habitat found in parts of the Goldwater Range and Coyote Basin eastward into low-relief lands east of the Avawatz Mountains. In general, the direct and indirect impacts on resident and migratory wildlife using habitats will be the same as those discussed previously under the Proposed Action (Section 4.5.1.1) and the Modified Coyote Basin Alternative (Section 4.5.3.1).

Sensitive Wildlife

Desert Tortoise

The Avawatz Alternative will have similar impacts on resident desert tortoises as those described for the Modified Coyote Basin Alternative (Section 4.5.3.1). Based on the 1988, 1990, and 1992 studies, an estimated 7,845 tortoises, mostly occurring in the heavy impact areas of less than 20-percent slope, and their habitats will be severely impacted. The highest concentrations of tortoises include the populations in the Coyote Basin and the North Alvord Slope.

Maneuvers on slopes of less than 20 percent will impact 105,869 acres of 0 to 19/square-mile tortoise density habitat, 36,726 acres of 20 to 49/square-mile tortoise density habitat, 21,457 acres of 50 to 99/square-mile tortoise density habitat, and 6,305 acres of 100 to 249/square-mile tortoise density habitat. The nature of the direct and indirect impacts on desert tortoises with this alternative will be similar to that described for the Modified Coyote Basin Alternative (Section 4.5.3.1).

Approximately 145,097 acres of designated critical habitat will be impacted by implementation of the Avawatz Alternative. This represents a loss of approximately 3 percent of the critical habitat in California and approximately 19 percent of the critical habitat in the Superior-Cronese unit.

Mohave Ground Squirrel

A total of 3,840 acres of BLM-designated Mohave ground squirrel crucial habitat will be impacted with this alternative. This impact is considered significant.

Other Sensitive Wildlife

Impacts on other sensitive wildlife with this alternative will be similar to those described under the Proposed Action (Section 4.5.1.1) and the Modified Coyote Basin Alternative (Section 4.5.3.1). Exceptions include the elimination of impacts on sensitive wildlife, such as Mojave fringe-toed lizards in the vicinity of the Soda Mountains and the elimination of some impacts in the vicinity of Lane Mountain.

4.5.6.2 Mitigation

General Vegetation

Mitigations for impacts on general vegetation and sensitive features, such as springs and desert willow habitat, are similar to those discussed under the Proposed Action (Section 4.5.1.2).

Sensitive Plants and Resources

For mitigations to impacts on sensitive species, refer to the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 15 through 17 and 19 through 21).

General Wildlife

Mitigation measures for general wildlife are similar in nature to those for the Proposed Action (Section 4.5.1.2, Mitigation Nos. 4 and 5) and the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 22 through 24).

Sensitive Wildlife

Desert Tortoise

The mitigation measures for the Avawatz Alternative are similar to those described for the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation Nos. 25 and 26).

Mohave Ground Squirrel

Mitigations for the Mohave ground squirrel are the same as those described for the Modified Coyote Basin Alternative (Section 4.5.3.2, Mitigation No. 27).

Other Sensitive Wildlife

Mitigation measures for this alternative are similar in nature to those described for the Proposed Action (Section 4.5.1.2, Mitigation Nos. 13 and 14).

4.5.7 No Action Alternative

4.5.7.1 General Vegetation

The No Action Alternative will not have significant direct or indirect impacts on the vegetation within the study area. Public lands within the study area are presently managed for several multiple uses, such as mining and cattle grazing. It is assumed that conditions under the No Action Alternative will continue to include recreation (OHV use, rock hounding, camping, hunting, and so forth), with some restrictions on lands managed by the BLM. Although these activities, as described in the CDCA Plan (BLM 1980), could have potentially significant adverse effects on vegetation, soils, and wildlife over time (BLM 1988c, 1988d), the vegetation habitat within most of the project area is currently considered to be of high to very high quality due to relatively low disturbance (USFWS 1988; M. Bagley, personal communication 1989).

Under the No Action Alternative, vegetation will still be affected by ongoing operations, including private development, mining, utility-related construction, and other permitted actions. Although the number of acres affected is undeterminable because of lack of sufficient data, impacts will most likely occur to the Mojave creosote scrub community. It is projected that any losses will be spread over a large enough area, and the integrity of large, contiguous, and relatively undisturbed habitat will not be significantly affected.

4.5.7.2 Sensitive Plants

Under the No Action Alternative, sensitive plant populations in the study area will continue to be subjected to current land uses. Potential for significant impacts exists from recreational activities, development, mining, or grazing unless those agencies having jurisdiction adopt protective measures.

4.5.7.3 General Wildlife

Public lands within the study area are presently managed for several multiple uses described above under the No Action Alternative for vegetation. Public lands within the study area provide important habitat for wildlife species, such as the desert tortoise, Mohave ground squirrel, raptors, and others. With the trend to develop increasing amounts of desert land for human habitation and use, public lands in this area provide remnant habitat that will largely be protected from development due to the Limited Use classification of most of the area and planned acquisition of private lands through the WMLTA Project. Planned or ongoing management activities occur within the CDCA that could benefit the desert tortoise and other wildlife using the same habitat, including directives for management of the desert tortoise (BLM 1988g, 1988h, 1989a) and the Desert Tortoise Recovery Plan.

4.5.7.4 Sensitive Wildlife

Desert Tortoise

Public lands will be managed under the Limited and Moderate multiple-use classes. Under the current management scenario, cattle grazing will continue in

the Cronese allotment. Allotment Management Plans (AMPs) will be developed for the grazing allotments and include new fencing and water developments with the goal of alleviating current distribution problems. The direct disturbance to tortoise habitat as a result of fencing and water developments will not exceed 20 acres per year. Beneficial changes in vegetation diversity and cover resulting from improved distribution will occur slowly, and substantial forage improvement may not be achieved in the foreseeable future (20 to 50 years). Trampling of juvenile tortoises, collapse of tortoise burrows, and modifications of habitat around creosote bushes where forage is concentrated and tortoise burrow density is highest will continue to represent a negative impact as a result of livestock grazing. Table 4.5-4 lists the area of each tortoise density category occurring in the study area.

Some cumulative impacts on the tortoise, such as vandalism and poaching, may actually be higher under this alternative because the public will retain access to public land. Predation by ravens and disease will be addressed in the desert tortoise Habitat Management Plan (HMP) and may decline under the No Action Alternative.

Based on similar activity within the resource area, the installation of new utilities is anticipated to involve two oil and gas pipelines and three 500-kV power lines over the next 10 years. These installations will disturb approximately 45 acres of public land per year. This amount of disturbance is not viewed as a significant impact on the desert tortoise because of the small acreage involved.

Approximately 260 acres will continue to be actively mined, although this figure might be expected to increase by 10 acres per year. Impacts on the desert tortoise from mining activities will continue to be considered nonsignificant.

The WMLTA Project will acquire about 250,000 acres of private lands currently subject to development and place them under BLM jurisdiction for resource protection and multiple use under the Limited Use Multiple-Use Class. Adding these checkerboard-pattern private lands will enhance habitat management opportunities by BLM by blocking up land units and limiting conflicting uses on adjacent private land. Approximately 57 square miles of private land desired for acquisition under the NTC expansion proposal will, under the No Action Alternative, be acquired under a voluntary exchange scenario by BLM and managed for protection of the desert tortoise and other multiple uses. Under the BLM, these lands will be protected from development, whereas in private ownership they will continue to be developed at a rate of approximately 20 acres per year.

Management of the area for desert tortoise habitat will include development of an HMP for the entire western Mojave population of the desert tortoise. This HMP may result in restrictions to activities such as livestock grazing, motorized recreation, and mining. As presented in the "Recommendations for Management of the Desert Tortoise in the California Desert (USFWS July 1988)," measures to protect the tortoise will be considered in the development of this HMP. Management decisions that could affect these activities will be subject to NEPA compliance and appropriate amendments to the CDCA Plan, including public participation opportunities. The positive effects of a desert tortoise HMP and the WMLTA Project are substantial and are expected by the BLM to aid in the recovery of the desert tortoise on public lands in the study area.

Mohave Ground Squirrel

The northwestern and western portions of the study area contain Mohave ground squirrel habitat. The activities described below will continue or be implemented under the No Action Alternative.

Public lands will be managed under the Limited Use Multiple-Use class. Domestic sheep grazing in the Superior Valley and Goldstone allotments will continue under AMPs that are to be developed. These AMPs will have the goal of alleviating distribution problems by providing fencing and water developments. AMP implementation will attempt to improve vegetation diversity and cover that, if achieved, could improve Mohave ground squirrel habitat. Continued grazing and improved grazing management will each have small effects on the Mohave ground squirrel that will tend to cancel each other out for little if any detectable net change.

Motorized recreation activities will continue with a projected slight increase in area use over time. While recreation activities are restricted to designated routes on public lands, private lands not acquired under the voluntary exchange principles of the WMLTA Project may continue to be affected by vehicle trespass.

The WMLTA Project represents a substantial increase in the manageability of public lands currently administered by BLM. It will also prevent the development of those private lands that are acquired and thus preserve Mohave ground squirrel habitat. This represents a net benefit to the Mohave ground squirrel and other biological resources. Management of the area for wildlife habitat will also include development of an HMP specific to the needs of the desert tortoise, but it will also benefit the Mohave ground squirrel. The positive aspects of the No Action Alternative derived from the WMLTA Project and the development of an HMP for the desert tortoise in the western Mojave Desert are substantial. It is expected by the BLM that these benefits will outweigh the potentially deleterious effects of increased motorized recreation and result in a net benefit to the Mohave ground squirrel.

Bighorn Sheep

The following activities occur under the Limited and Moderate Use Multiple-Use classes within the study area's bighorn sheep transition habitat:

- Mining, especially for gravel and building materials, will be anticipated in the Cronese Mountains. Most mining in the region is currently limited to discrete sites with designated access.

- Motorized recreation such as camping, sightseeing, rock hounding, and associated vehicle use (limited to designated existing routes) will be allowed. Increased human access in the transition habitat will displace bighorns because this species characteristically avoids human activities. The amount of disturbance to bighorns will be directly related to the degree of increased activity by humans and is expected to be nonsignificant.

- Livestock grazing will continue in the Cronese allotment where year-round cattle grazing currently occurs. While cattle and bighorn sheep may use the same foraging areas, the bighorn use steep and rocky terrain for escape that is not used by cattle. Studies on the potentially deleterious effects of cattle on bighorn and bighorn using the same foraging and watering areas are currently being conducted by the CDFG in the Old Dad, Marble, and Cady Mountains.

If Congress determines that the WSAs are to be designated as wilderness areas, existing levels of bighorn sheep activity will continue and probably increase over time. The rate of increase is expected to be slow because these areas are not particularly well suited to additional grazing. Existing motorized recreation will be eliminated, and new mining activity will be severely limited, if not completely prohibited. Existing mines could be allowed to continue in operation, and existing grazing leases will be unaffected. The net effect will be a reduction in the current amount of human activities and a subsequent reduction in the impacts on bighorn sheep.

If Congress determines that the WSAs are not to be designated as wilderness areas, existing levels of activities will continue and probably increase over time. The rate of increase is expected to be slow because these areas are not particularly well suited to additional grazing or motorized recreation. New mining activity, especially in the Northern Avawatz, will represent a potentially serious impact on bighorn sheep. The magnitude of such an impact will depend on the specific location of any mines. Increased activity in bighorn transition habitat will reduce the amount of habitat available for foraging, lambing, and seasonal movements; disrupt migration corridors and potential gene transfer between the Avawatz, Soda, and Cady Mountains; and discourage use within the three mountain ranges mentioned. Continued BLM jurisdiction of bighorn sheep habitat in the Avawatz and Soda Mountains will include restrictions to activities required under the Wilderness Interim Management Plan Guidelines until Congress makes a determination on the three WSAs.

4.5.8 Cumulative Impacts

Implementation of some of the projects within the cumulative list combined with the continued multiple use practices of the desert will result in a reduction in vegetation resources and wildlife habitat within the western Mojave Desert region. Multiple use practices in the desert, including OHV use, hunting, and grazing, serve to degrade natural vegetation and wildlife resources and will continue to do so in the future. Implementation of the land acquisition by the NTC will result in a significant cumulative loss of vegetation and wildlife resources and wildlife habitat.

In addition, there will also be a significant cumulative loss of desert tortoise habitat and habitat for other species of sensitive wildlife and plants.

Implementation of several of the projects within the cumulative list may have some beneficial effects on vegetation and wildlife resources in the western Mojave Desert region. Consolidation of public and private lands and elimination of the checkerboard land ownership pattern across the desert through implementation of the WMLTA Project will serve to transfer ownership of some of the higher-quality tortoise habitat to the BLM. This will have beneficial effects because private development in high-quality tortoise habitat will be restricted. However, under the ownership of the BLM, the acquired lands will be subjected to current multiple use practices, and this could have a detrimental effect. The HMP for the western Mojave Desert will have beneficial effects for vegetation and wildlife resources because multiple uses in high-quality habitat areas will be restricted. This will also serve to benefit the desert tortoise and other sensitive plant and wildlife species. The California Desert Protection Act (CDPA) will protect a substantial portion of the western Mojave Desert and the vegetation and wildlife resources that occur there. However, the CDPA is protecting primarily more mountainous regions rather than large valleys with less than 20-percent slopes.

4.5.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is described in Table 4.5-11. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is described in Table 4.5-12.

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Table 4.5-11

BIOLOGICAL RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Proposed Action	Modified Avawatz-Silurian Alternative	Modified Coyote Basin Alternative	Alvord Alternative	Superior Valley Alternative	Avawatz Alternative	No Action
Plant Habitat	Potential significant impact on 331,217 acres of native Mojave Desert vegetation. Significant loss of 2,845 acres of Joshua tree woodland and 9,707 acres of desert sand fields and dunes. Potential significant impacts on springs.	Potential significant impact on 270,030 acres of native Mojave Desert vegetation. Significant loss of 2,700 acres of Joshua tree woodland and 6,330 acres of desert sand field and dunes. Potential impacts on springs.	Potential significant impact on 259,470 acres of native Mojave Desert vegetation. Loss of 741 acres of Joshua tree woodland/ Mojave woody scrub mix. Potential significant impacts on springs.	Potential significant impact on 210,800 acres of native Mojave Desert vegetation. Potential significant impacts on springs.	Potential significant impact on 284,885 acres of native Mojave Desert vegetation. Significant loss of Joshua tree woodland. Potential impacts on springs.	Potential significant impact on 185,500 acres of native Mojave Desert vegetation.	No significant impact.
Sensitive Plant Species	Potential impacts on one FSOC and several sensitive species.	Potential impacts on one FSOC and several sensitive species.	Significant impacts on one proposed listed endangered species, one FSOC, and one sensitive species.	Significant impacts on one proposed listed endangered species and one FSOC.	Significant impacts on one proposed listed endangered species and two FSOC.	Significant impacts on one proposed listed endangered species, one FSOC, and one sensitive species.	Potential significant impact on one proposed listed plant species and several sensitive plant species. No change in current BLM multiple-use management.
Wildlife Habitat	Significant loss or disturbance to 272,780 acres of valuable wildlife habitat, including the Salt Creek riparian habitat, Sheep Creek Springs, Owl Hole Springs, and the tributaries of the Amargosa River. Significant impacts on resident and migratory wildlife and wildlife movement corridors. Significant impacts on sensitive wildlife resources.	Significant loss of or disturbance to 222,163 acres of valuable wildlife, habitat including Sheep Creek, Owl Hole Springs, and the tributaries of the Amargosa River. Significant impacts on resident and migratory wildlife and wildlife movement corridors. Significant impacts on sensitive wildlife resources.	Significant impact on 234,136 acres of valuable wildlife habitat, including Paradise Springs, Jack Springs, Jackrabbit Springs, the slopes of Alvord and Soda Mountains, and active dune systems in the vicinity of the Soda Mountains. Significant impacts on resident and migratory wildlife and wildlife movement corridors. Significant impacts on sensitive wildlife resources.	Impact on 190,727 acres of valuable wildlife habitat, including the slopes of Alvord and Soda Mountains and active dune systems in the vicinity of the Soda Mountains. Significant impacts on resident and migratory wildlife and wildlife movement corridors.	Significant impact on 241,392 acres of wildlife habitat in parts of the Coyote Basin eastward into low-relief lands south of the Avawatz Mountains. Significant impacts on resident and migratory wildlife and wildlife movement corridors. Significant impacts on sensitive wildlife resources.	Significant impact on 164,048 acres of wildlife habitat in parts of the Goldwater Range and Coyote Basin eastward into low-relief lands east of the Avawatz Mountains. Significant impacts on resident and migratory wildlife and wildlife movement corridors. Significant impacts on sensitive wildlife resources.	No significant impact.
Sensitive Wildlife Species Desert Tortoise	Substantial loss of low to moderate desert tortoise habitat within the Silurian Hills, Valjean Valley, and Soda Mountains. Significant impact on tortoise populations.	Substantial loss of low to moderate desert tortoise habitat within the Silurian Hills and Valjean Valley. Significant impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat within the North Alvord Slope, Southwest Coyote Basin, east of Lane Mountain, and west of Cronese Mountains. Significant impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat. Significant impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat within Superior Valley and west of Cronese Mountains. Significant impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat. Significant impact on tortoise populations.	Potential significant impacts on desert tortoise. No change in current BLM multiple-use management.
Other Sensitive Species	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, Gila woodpecker, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, Gila woodpecker, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, burrowing owl, bats, badger, and Nelson's bighorn sheep.	No change in current BLM multiple-use management.

Table 4.5-12

BIOLOGICAL RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Proposed Action	Modified Avawatz-Silurian Alternative	Modified Coyote Basin Alternative	Alvord Alternative	Superior Valley Alternative	Avawatz Alternative
Plant Habitat	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Significant impacts on Joshua tree woodland and desert sand fields and dunes. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Significant impacts on Joshua tree woodland and desert sand fields and dunes. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Impacts on 741 acres of Joshua tree woodland/ Mojave woody scrub mix. Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling.	Significant impact on native Mojave Desert vegetation, including a large impact on the Joshua tree woodland community. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Military vehicles restricted from springs; impacts reduced to not significant.
Sensitive Plant Species	Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Impacts on the FSOC and sensitive species are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Military vehicles will be restricted from springs. Impacts on the FSOC are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Impacts on two FSOCs are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Impacts on the FSOC species and sensitive species are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.
Wildlife Habitat	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.
Sensitive Wildlife Species Desert Tortoise	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
Other Sensitive Species	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.

4.6 CULTURAL RESOURCES

Many of the historic and prehistoric deposits in the desert are surface manifestations with little or no depth. Two factors associated with the training mission of the NTC adversely affect archaeological deposits: (1) denudement of the area of vegetation and breakdown of the soil's crust exposing archaeological deposits to soil erosional factors, and (2) the direct horizontal and vertical displacement, damage, and destruction of artifacts and features resulting from tracked vehicles traffic and excavations associated with maneuvers. Both actions have a significant adverse impact on archaeological sites, an unknown number of which may be determined eligible for the National Register of Historic Places (NRHP).

A total of 453 prehistoric archaeological sites, 201 historic sites, and 13 sites with both prehistoric and historic components are currently recorded within all study areas. Surveys conducted have been sample surveys, and as such have not covered 100 percent of the study areas. As a result, these sites represent only a portion of those that may be present. Most of the identified sites appear to be located in the valley and basin floors where water and/or other critical resources were present to sustain habitation. These sites could be adversely affected by proposed military land use of the area for training maneuvers. Tracked and other vehicular traffic traversing across valley and basin floors will degrade archaeological deposits and eventually destroy their context. Sites located in staging areas will be destroyed through the clearing and staging process, and excavations for tank traps and emplacements could also result in the destruction of cultural resources. Unauthorized collecting and vandalism will degrade cultural resources where they occur.

While the Army is committed to developing and implementing identification, evaluation, and mitigation measures in accordance with laws and regulations, there remains a risk that some sites not found during surveys may be damaged or destroyed by military vehicle maneuvers. Although data for an accurate extrapolation are unavailable at this time, there is a potential for one or more potentially eligible cultural resources to be negatively impacted during military maneuvers. Those sites occurring on valley floors, where staging activities and maneuvers are intensive, could be damaged or destroyed by the large numbers of vehicles and soldiers using the area during military training. Despite the Army's best efforts to find, evaluate, and mitigate sites, the potential exists to miss cultural resources during surveys, and there is a potential that these sites will be destroyed.

4.6.1 Proposed Action

4.6.1.1 Impacts

While there are insufficient data to quantify all impacts on cultural resources in this alternative because inventories have not been completed for the entire study area, a total of 74 prehistoric sites and 36 historic sites are known to be present within this alternative (Table 4.6-1). They represent only a portion of the potential sites and are presented here for comparative purposes. Many of these sites are potentially eligible for listing on the NRHP.

These sites could be adversely affected by proposed military land use of the area for training maneuvers.

4.6.1.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of NTC funding:

1. Section 106 consultation will be required for formal determination of NRHP eligibility for all sites in this alternative. Formal eligibility can only be determined in consultation with the SHPO. Additional mitigation measures for potential adverse effects on cultural resources will be formulated after eligibility determinations are concluded. A Programmatic Agreement (PA) between the Army, the California SHPO, and the Advisory Council on Historic Preservation shall be instituted to determine the program for treatment of cultural resources.

4.6.2 Modified Avawatz-Silurian Alternative

4.6.2.1 Impacts

While there are insufficient data to quantify all impacts on cultural resources in this alternative because inventories have not been completed for the entire study area, a total of 72 prehistoric sites and 23 historic sites are known to be present within this alternative. They represent only a portion of the potential sites and are presented here for comparative

Table 4.6-1

NUMBER OF KNOWN PREHISTORIC/HISTORIC SITES[a, b, c]

Description	I	II	III	IV	V	TOTAL
Proposed Action	5/7	27/10	14/4	11/8	17/7	74/36
Modified Avawatz-Silurian	2/3	21/10	10/2	11/6	28/2	72/23
Modified Coyote Basin	6/26	38/3	46/22	48/11	42/32	180/94
Alvord	3/21	31/0	32/13	40/0	28/2	134/36
Superior Valley	3/26	26/52	32/67	21/19	27/3	109/167
Avawatz	3/22	22/8	34/16	23/8	22/2	104/56

I Probably eligible for NRHP
II Moderate potential for eligibility
III Low potential for eligibility
IV Not eligible
V Unknown potential for eligibility

[a] **Because the boundaries of some alternatives overlap others, some sites are included in more than one alternative.**

[b] **Site frequencies are based on limited surveys; many more sites are expected when intensive surveys are initiated and completed. Eligibility recommendations are based on evaluations made by the contractor and have not yet been formally coordinated with the SHPO.**

[c] **Data from 1995 survey not included because recommendations have not been completed.**

purposes. Many of these sites are potentially eligible for listing on the NRHP.

Known and unknown sites could be adversely affected by proposed military land use of the area for training maneuvers.

4.6.2.2 Mitigation

Mitigations for impacts on cultural resources are the same as those discussed under the Proposed Action (Section 4.6.1.2).

4.6.3 Modified Coyote Basin Alternative

4.6.3.1 Impacts

While there are insufficient data to quantify all impacts on cultural resources in this alternative because inventories have not been completed, a total of 180 prehistoric sites and 94 historic sites are known to be present in this alternative. They represent only a portion of potential sites but are presented here for comparative purposes. Many of these sites are considered potentially eligible for listing on the NRHP per the discussion in Section 3.6.3 of this document.

Known and unknown sites could be adversely affected by proposed military land use of the area for training maneuvers.

4.6.3.2 Mitigation

Mitigations for impacts on cultural resources are the same as those discussed under the Proposed Action (Section 4.6.1.2).

4.6.4 Alvord Alternative

4.6.4.1 Impacts

While there are insufficient data to quantify all impacts on cultural resources in this alternative because inventories have not been completed, a total of 134 prehistoric sites and 36 historic sites are known to be present within the proposed Alvord Alternative. They represent only a portion of potential sites and are presented here for comparative purposes. Many of these sites are considered potentially eligible for listing on the NRHP per the discussion in Section 3.6.3 of this document.

Known and unknown sites could be adversely affected by proposed military land use of the area for training maneuvers.

4.6.4.2 Mitigation

Mitigations for impacts on cultural resources are the same as those discussed under the Proposed Action (Section 4.6.1.2).

4.6.5 Superior Valley Alternative

4.6.5.1 Impacts

While there are insufficient data to quantify all impacts on cultural resources in this alternative because inventories have not been completed, a total of 109 prehistoric sites and 167 historic sites are known to be present in this alternative. They represent only a portion of potential sites and are presented here for comparative purposes. Many of these sites are considered potentially eligible for listing on the NRHP per the discussion in Section 3.6.3 of this document.

Known and unknown sites could be adversely affected by proposed military land use of the area for training maneuvers.

4.6.5.2 Mitigation

Mitigations for impacts on cultural resources are the same as those discussed under the Proposed Action (Section 4.6.1.2).

4.6.6 Avawatz Alternative

4.6.6.1 Impacts

While there are insufficient data to quantify all impacts to cultural resources in this alternative because inventories have not been completed, a total of 104 prehistoric sites and 56 historic sites are known to be present within his alternative. They represent only a portion of potential sites and are presented here for comparative purposes. Many of these sites are considered potentially eligible for listing on the NRHP per the discussion in Section 3.6.3 of this document.

Known and unknown sites could be adversely affected by proposed military land use of the area for training maneuvers.

4.6.6.2 Mitigation

Mitigations for impacts on cultural resources are the same as those discussed under the Proposed Action (Section 4.6.1.2).

4.6.7 No Action Alternative

4.6.7.1 Impacts

Continued management by the BLM of public lands within the study area will include multiple uses under the Limited and Moderate Use Multiple Use Classes. These uses include livestock grazing in the Superior Valley, Goldstone, and Cronese Lake allotments; dispersed recreation including vehicle use of designated routes; education and research; utility transmission lines; communication sites; and mining. These latter three actions are generally discrete in the area affected and accessed via newly permitted designated routes.

Trampling by livestock can disrupt materials on the soil surface that will, over time, diminish site integrity and occasionally break up the artifacts themselves. Impacts on cultural resources from livestock grazing are acknowledged and in compliance with a 1970 Programmatic Memorandum of Agreement (PMOA) between the Advisory Council on Historic Preservation, the State Office of Historic Preservation, and the BLM. Recreational use of the area, while dispersed in nature, does tend to focus on areas of previous human occupation and use, such as Spanish Canyon and Paradise Springs. Artifacts and sites as a

result could be subject to inadvertent destruction and damage by vehicles or by intentional vandalism or collection. Sites not within the immediate vicinity of these focal points of use would not be as likely to be damaged or destroyed as a result of recreational activities.

Mining occurs in the Limited Use Multiple Use Class under the requirement of a Plan of Operations. Filing the plan allows the BLM the opportunity to determine whether cultural resources may be present at the specific site affected by mining. The BLM then evaluates the NRHP eligibility of the site(s) and determines appropriate mitigation. For utility transmission rights-of-way or communication sites that may be permitted on public lands, site-specific evaluations of activities occur prior to permitting. As required by law, the SHPO and the Advisory Council on Historic Preservation are consulted and allowed the opportunity to comment on all federal undertaking and permitting actions.

Actions on state and private lands are subject to CEQA, which also requires that important cultural and scientific resources be identified, evaluated, and mitigated for adverse effects. Net impacts of the No Action Alternative will not be significant.

4.6.7.2 Mitigation

Existing sites may continue to be affected over time by livestock grazing. Recreational use of Spanish Canyon and Paradise Springs will continue to alter sites. Education and research will allow continued collection information from cultural sites in the study area, and site-specific evaluation and mitigation will continue to be applied to federal actions on public lands.

4.6.8 Cumulative Impacts

Expanding human activity in the high desert, including the expansion of military activities, and power line construction have had an impact on historic properties already present. Activities under the authority of the federal government since the 1970s have resulted in the identification of a significant number of cultural and scientific resources. Many of these resources have been identified as a result of federal and state legal requirements and have been investigated as part of the evaluation and mitigation process. These investigations have made a very positive contribution to our knowledge of the Mojave Desert. The cumulative beneficial impact of a project is the opportunity for required archaeological surveys to screen, evaluate, and report on over 200,000 acres containing potentially over 1,000 prehistoric and historic sites representing over 12,000 years of human history in the region.

Development that occurred without archaeological surveys, evaluation, and data collection either prior to federal and state laws, or on lands not subject to these laws, has resulted in substantial loss of information. The development and expansion of uses in the desert have also resulted in the net loss of nonrenewable cultural and scientific resources. In the event that planned surveys are not 100 percent successful in locating and identifying resources that may be eligible for listing on the NRHP in the area to be impacted by military activities, additional cultural resource information will be lost.

4.6.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.6-2. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.6-3.

Table 4.6-2

CULTURAL RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Prehistoric	Seventy-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Seventy-two known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred eighty known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred thirty-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred nine known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	No change in current BLM multiple use management.
Historic	Thirty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Twenty-three known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Ninety-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Thirty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred sixty-seven known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Fifty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	No change in current BLM multiple use management.

Table 4.6-3

CULTURAL RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Prehistoric - Could impact potential NRHP sites.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
Historic - Could impact potenital NRHP sites.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.

4.7 PALEONTOLOGY

A number of fossil-bearing geological strata are present within the overall study area that have the potential for yielding important fossils.

4.7.1 Proposed Action

Very little of the study area has been surveyed to locate significant paleontological deposits; therefore, specific impacts on paleontological sites as a result of training maneuvers cannot be determined.

4.7.1.1 Impacts

It is expected that surface exposures in the valley and basin floors will be directly affected by training because intensive vehicle traffic will result in degradation of exposed fossils or those within about 1 foot of the surface. Buried fossil deposits will not be directly affected by intensive vehicle use, but if present will be impacted by trenching and excavations associated with training activities. Most fossil sites will be readily apparent during surveys. However, some risk of damage to significant fossils remains, particularly where soil and subsoil disturbance is intensified in valley areas (staging areas and maneuver corridors). With the intensity of the impact expected from the Army's proposed use of the area, it is anticipated that significant disturbance of fossil-bearing strata will occur to resources lying just beneath visible ground surface. Paleontological deposits located in higher elevations are not likely to be affected.

4.7.1.2 Mitigation

The following mitigation measure will be implemented, subject to availability of NTC funding.

1. The NTC shall implement a program of resource identification. The area shall require paleontological survey to locate significant fossil deposits. If fossil deposits are located, they shall be evaluated to determine the effect of training activities and the feasibility of avoidance. If avoidance is not possible, the sites shall be mapped, and data will be recovered and then curated at an appropriate institution. A standard paleontologic resource impact mitigation program must be developed in accordance with the CEQA guidelines and the Society of Vertebrate Paleontology.

4.7.2 Modified Avawatz-Silurian Alternative

Very little of the study area has been surveyed to locate significant paleontological deposits; therefore, specific impacts on paleontological sites as a result of training maneuvers cannot be determined.

4.7.2.1 Impacts

Impacts for this alternative are the same as those discussed under the Proposed Action (Section 4.7.1.1).

4.7.2.2 Mitigation

Mitigations for impacts on paleontological resources are the same as those discussed under the Proposed Action (Section 4.7.1.2).

4.7.3 Modified Coyote Basin Alternative

Very little of the study area has been surveyed to locate significant paleontological deposits; therefore, specific impacts on paleontological sites as a result of training maneuvers cannot be determined.

4.7.3.1 Impacts

Impacts for this alternative are the same as those discussed under the Proposed Action (Section 4.7.1.1).

4.7.3.2 Mitigation

Mitigations for impacts on paleontological resources are the same as those discussed under the Proposed Action (Section 4.7.1.2).

4.7.4 Alvord Alternative

Very little of the study area has been surveyed to locate significant paleontological deposits; therefore, specific impacts on paleontological sites as a result of training maneuvers cannot be determined.

4.7.4.1 Impacts

Impacts for this alternative are the same as those discussed under the Proposed Action (Section 4.7.1.1).

4.7.4.2 Mitigation

Mitigations for impacts on paleontological resources are the same as those discussed under the Proposed Action (Section 4.7.1.2).

4.7.5 Superior Valley Alternative

Very little of the study area has been surveyed to locate significant paleontological deposits; therefore, specific impacts on paleontological sites as a result of training maneuvers cannot be determined.

4.7.5.1 Impacts

Impacts for this alternative are the same as those discussed under the Proposed Action (Section 4.7.1.1).

4.7.5.2 Mitigation

Mitigations for impacts on paleontological resources are the same as those discussed under the Proposed Action (Section 4.7.1.2).

4.7.6 Avawatz Alternative

Very little of the study area has been surveyed to locate significant paleontological deposits; therefore, specific impacts on paleontological sites as a result of training maneuvers cannot be determined.

4.7.6.1 Impacts

Impacts for this alternative are the same as those discussed under the Proposed Action (Section 4.7.1.1).

4.7.6.2 Mitigation

Mitigations for impacts on paleontological resources are the same as those discussed under the Proposed Action (Section 4.7.1.2).

4.7.7 No Action Alternative

While many multiple uses will occur on public lands under BLM management, only infrequent types of uses will have the potential to disturb or disrupt paleontological resources. Hard rock or open pit mining, road construction involving cuts and fills, and underground utility construction are examples of some potential activities that will occur with continued BLM management of the area and could affect paleontological resources.

The BLM will continue to provide protection to paleontological resources and localities. Identification, evaluation, and mitigation measures to alleviate adverse effects of federal undertakings on paleontological resources are implemented as deemed appropriate by BLM as a federal agency. Large mine Plans of Operation and road and utility rights-of-way applications that are filed with BLM prior to approval of the activity allow paleontological resources to be considered in the site-specific permitting analyses. CEQA requires the identification, evaluation, and mitigation of adverse effects on important cultural and scientific resources, which include paleontological resources.

4.7.8 Cumulative Impacts

Expanding human activity in the high desert, including the expansion of desert communities, increased recreational use, expanding military activities, and power line construction, has had an impact on paleontological resources. Many of these resources have been identified as a result of federal and state legal requirements and have been investigated as part of the evaluation and mitigation process. These investigations have made a very positive contribution to our knowledge of the Mojave Desert. The cumulative beneficial impact of a project the size of the proposed NTC expansion is the opportunity for required paleontological surveys to screen, evaluate, and report on over 200,000 acres containing potentially significant deposits of Miocene, Pliocene, and Pleistocene fossils.

Development that occurred without paleontological surveys, evaluations, and data collection either prior to federal and state laws or on lands not subject to these laws has resulted in substantial loss of information. The development and expansion of uses in the desert have also resulted in the net loss of these nonrenewable

resources. In the event that planned surveys are not 100 percent successful in locating and identifying significant paleontological resources in areas impacted by military activities, additional paleontological information will be lost.

4.7.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.7-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.7-2.

Table 4.7-1

PALEONTOLOGICAL - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz	No Action
Paleontological Deposits	Potential significant impact on paleontological deposits lying beneath visible ground surface.	Potential significant impact on paleontological deposits lying beneath visible ground surface.	Potential significant impact on paleontological deposits lying beneath visible ground surface.	Potential significant impact on paleontological deposits lying beneath visible ground surface.	Potential significant impact on paleontological deposits lying beneath visible ground surface.	Potential significant impact on paleontological deposits lying beneath visible ground surface.	No impact.

Table 4.7-2

PALEONTOLOGICAL - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Potential impacts on paleontological deposits lying beneath visible ground surface.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.

4.8 AIR QUALITY

Significant air quality impacts are defined as those that cause, or contribute to, an exceedance of a federal or state ambient air quality standard (AAQS) listed in Table 3.8-2 or exceed daily threshold levels set by the MDAQMD (described in Section 4.8.3.1).

4.8.1 Proposed Action

To understand the potential impacts associated with the Proposed Action, one must first understand the existing operations. A detailed General Conformity Requirements Study was conducted in 1996 to analyze the impacts of the Proposed Action (AeroVironment 1996, Appendix E). Currently, the Army conducts a 15-day rotational training schedule, typically 12 times throughout the year. Training activities include the use of tracked and wheeled vehicles and armored and mechanized forces. Currently, OPFOR and BLUFOR (Rotation Training Unit) produce 61,181 and 250,077 vehicle miles, respectively (311,258 vehicle miles total), for the existing 15-day rotation. A typical exercise would involve approximately 1,950 vehicles, both tracked and wheeled. Additionally, approximately 140 aircraft are involved. The 15-day rotation splits mechanized forces from armored forces for the first 11 days of rotation. During days 0 through 5, mechanized forces conduct "light fire" operations, and the armored forces conduct "force-on-force" operations. During days 6 through 10, the mechanized and armored forces switch operations. During the final 4 days, the forces are brought together to perform force-on-force "brigade" operations. These operations are initiated at the cantonment area and conducted in an area in the approximate center of the reservation. Supply convoys travel back and forth to the cantonment area periodically throughout the rotational schedule for supplies.

4.8.1.1 Impacts

Construction

The Proposed Action will require construction of undercrossings so that vehicles may pass east and west of State Highway 127. Furthermore, some construction of roads and camera towers will occur so that training exercises can be monitored. The emissions produced from this construction will be minimal when compared to the operational impacts from the training exercises, and construction emissions will not be considered further in this document.

Gaseous Emissions

The acquisition of approximately 331,217 acres will add approximately 52 percent more land to Fort Irwin NTC. While this land acquisition would be expected to increase travel during training, as demonstrated by AeroVironment Environmental Services (AES 1996), actual vehicle mileage is expected to decrease. Under the Proposed Action, brigade operations will take place all 15 days of the rotation with force-on-force occurring on days 0 through 8 and light fire occurring on days 9 through 14. Repeated trips to the cantonment area will be eliminated by establishing the Division Support Area (base camp) in the vicinity of the rotational activity instead of the cantonment area, as is currently done. In addition, the operating forces' training activity will be greatly reduced because the brigade will train as a unit rather than split between mechanized and armored forces. (With the exception of the No Action Alternative, these same assumptions are used in the comparison of all alternatives.)

AES in cooperation with the Army developed a comprehensive listing of existing and projected equipment use and routes for both existing and proposed operations associated with the Proposed Action. Emissions for these operations were developed using the South Coast Air Quality Management District's *CEQA Air Quality Handbook* (*Handbook*) (1993). (Note that the *Handbook* had not been released when the initial air quality report for the expansion of Fort Irwin NTC was prepared.)

The Proposed Action would reduce OPFOR and BLUFOR mileage to 41,795 and 243,376 miles (285,171 miles total) per rotation, respectively. Emissions for this travel were based on emission factors included in the *Handbook* for heavy trucks. Note that while this may underestimate emissions from some of the largest diesel-powered equipment, it overestimates emissions from smaller vehicles (e.g., High Mobility Multipurpose Wheeled Vehicles [HMMWVs]) as well as those that are powered by gas turbines (e.g., M1A1 tanks), which run more efficiently. In accordance with the information provided by AES, these vehicles have an average speed of approximately 18 mph. In this analysis a more conservative (and higher emitting) average speed of 15 mph was used. Additionally, 1997 emission

factors were used in projected vehicle emissions. Note that because the number of vehicles associated with the Proposed Action, as well as the alternatives, is not expected to change (only the distances differ), the number of vehicle starts (both cold and hot) would remain fairly constant. Additionally, air operations would remain essentially unchanged. Therefore, this analysis is based on the total daily mileage, and while this may not present a clear representation of all emissions, it does present the differences in emissions associated with each alternative.

In accordance with Table 4.8-1, the Proposed Action would reduce all pollutant types through a reduction in mileage resulting in a beneficial impact of the project.

While the expansion will bring the boundary of the Fort to within 7 miles of Baker, 15 miles of Harvard, 24 miles of Yermo, and 34 miles of Barstow, the local winds typically blow from the southwest away from these receptors. Furthermore, no combat maneuvers would take place in the land acquisition area, only in the staging and support camps. Therefore, no offsite receptors will be exposed to air pollutant concentrations from Fort Irwin expansion activities in excess of federal or state levels, and these receptors will not be significantly impacted. Similarly, because of the distances to the areas of acquisition from the cantonment area, onsite receptors will not be exposed to levels of pollutants that are any higher than those currently existing in the area. Furthermore, pollutant concentrations may actually be reduced in the cantonment area because the training exercises are extended away from this area.

Particulate Emissions

Particulate emissions, both exhaust and dust, were determined by AES through an extensive analysis of vehicle patterns used in the training exercises. This analysis, developed in cooperation with the MDAQMD, was used to determine federal conformity and is included in "General Conformity Requirements, Land Acquisition Project, Fort Irwin National Training Center" (1996). Both vehicle travel and wind erosion of disturbed surfaces were addressed in the AES analysis. Furthermore, sieve analysis of native soil was used to determine PM-10 content.

The analysis estimates that approximately 409,292 pounds of PM-10 are generated over a typical existing rotation. Based on 15 days per rotation, this equates to 27,286 pounds per day. The Proposed Action will reduce vehicle mileage and the amount of dust raised. Mileage would decrease by approximately 26,087 per rotation or roughly 1,740 miles per day. The decrease in vehicle travel is estimated to reduce PM-10 dust emissions by 33,430 pounds per rotation or 2,229 pounds per day for each of the 15 days. This equates to a yearly savings of 200.6 tons of PM-10 and is a beneficial impact of the project.

While dust will be reduced overall, it may be redistributed due to differing vehicle paths. However, because the acquisition area will be used solely for staging and support camps, large volumes of dust (when compared with actual field games) are not expected to occur in this area.

Observations at Camp Pendleton have shown that dust lofting from tanks and helicopter prop wash within 2,000 feet of the highway may create a driving hazard. Beyond that distance, dilution will thin out the cloud to where visibility is not significantly impaired, but there is still traffic slowing and moderate hazard until the source-receptor distance reaches 3,000 to 4,000 feet. PM-10 dust emissions are anticipated to travel as much as 2 miles downwind and as much as 9 miles during nighttime and daytime activities, respectively. Based on the existing area and position of Fort Irwin, prevailing winds are usually parallel to I-15 blowing from the southwest, and this dust will not be carried toward offsite population centers or the Death Valley National Park area.

Valley fever, also called desert fever, occasionally occurs in association with increased dust production in the arid regions of southern California. Spores of the organism *Coccidioidomycosis* are present within the soil layers, but the likelihood of the occurrence of this organism in concentrations high enough to cause illness in humans is unknown within the study area. Because this disease is not known to be associated with the soil disturbance and dust production from the existing NTC, it is not likely that occurrence of this disease will increase as a result of the Army's proposed use of the study area for this or any of the other alternatives, and valley fever will not be addressed further in this document.

Operational dust clouds from NTC activities within the Silurian area will stay mainly north of I-15 and south of Death Valley (typically crossing State Highway 127) between Silver Lake and the Sperry Hills and will raise dust and PM-10 levels, potentially obscuring

Table 4.8-1

EXISTING AND PROJECTED EMISSIONS FOR THE PROPOSED ACTION[1]

Scenario	Carbon Monoxide (lb/day)	Nitrogen Oxides (lb/day)	Reactive Organic Gases (lb/day)	Sulfur Oxides (lb/day)	PM-10 Particulates (lb/day)
Existing Operations	972.1	289.7	128.4	14.6	23.3
With Project	890.6	263.8	117.6	13.3	21.3
Difference	-81.5	-25.9	-10.8	-1.3	-2.0
Yearly Savings (tons/yr)	7.3	2.3	1.0	0.1	0.2

[1] **Based on "running emissions" for both tracked and wheeled vehicles and does not include starts or aircraft support. Values are averaged per day for each of the 15 days of rotation.**

visibility in the Dumont Dune recreational area and significantly impacting recreational land uses in this area. Furthermore, obscured visibility across State Highway 127 will create a significant impact. Additionally, a component to the wind pattern blows from the north to the south. At its southernmost point, the project area parallels I-15 for a distance of about 5 miles. The project boundary is located in excess of 4,000 feet along the length and will not create a significant visibility impact across the highway.

4.8.1.2 Mitigation

Fort Irwin has instituted a program in which areas not frequently used are revegetated with native plants. These areas are watered regularly; consequently, revegetated areas grow much faster than under typical desert conditions. This reduces wind erosion over disturbed surfaces that receive little operational use.

While overall dust levels are expected to decline with project implementation, potentially significant impacts (i.e., reduced visibility across State Highway 127) could occur. The following will reduce this impact on a level that is less than significant.

The following mitigation measures shall be implemented, subject to availability of funding:

1. The NTC shall implement the dust control measures including the use of snow fencing, vegetation, and safety hazard signs.

2. Dust control measures such as regular watering, chemical treatment, and an asphalt chip sealer shall be used in primary dust generation areas.

Dust control measures, such as site watering, typically have a control efficiency of about 50 percent. Chemical treatment and soil sealants may have control factors in excess of 90 percent. Implementation of these, or equally effective measures, can reduce site-generated dust below current levels, even with implementation of the various alternatives. This would reduce any potential impacts to less than significant.

4.8.2 Modified Avawatz-Silurian Alternative

This alternative would involve acquiring approximately 294,530 acres with 24,500 of these located to the north dedicated as a buffer zone leaving an effective area of 270,030 acres for expansion. This value represents an increase of approximately 42 percent.

However, based on the configuration of the land to be acquired, the ability for linear travel will be similar to the Proposed Action.

4.8.2.1 Impacts

Gaseous Emissions

As with the Proposed Action, the acquisition area would be used for base camp and staging, and the actual training maneuvers would remain in their current locations. Because no extensive modeling of vehicle movement patterns was developed for this alternative, any increase/decrease in mileage over existing conditions was developed in relation to the Proposed Action.

While the area of acquisition is reduced from that of the Proposed Action, base camp/staging area placement would remain essentially unchanged and vehicles could travel essentially the same distance. (However, the placement of potential base camp/ staging areas would be reduced.) Therefore, worst-case projected emissions would be similar to those developed for the Proposed Action. Differences in emissions between this alternative and the existing scenario are included in Table 4.8-2. As with the Proposed Action, this alternative will reduce all emissions types and is considered a beneficial impact of the project.

Furthermore, this alternative will only bring the east boundary of the Fort to within 9 miles of Baker and will not change the distances to Harvard, Yermo, or Barstow. Based on these distances, no offsite receptors will be exposed to air pollutant concentrations in excess of federal or state levels. Similarly, due to the distances to the areas of acquisition from the cantonment area, onsite receptors will not be exposed to levels of pollutants that are any higher than those currently existing in the area.

Particulate Emissions

Because of a similar level of travel as predicted for the Proposed Action, this alternative would be expected to generate a similar level of PM-10 particulate savings (i.e., 33,430 pounds per rotation or 2,229 pounds per day for each of the 15 days). This equates to a yearly savings of 200.6 tons of PM-10 and is a beneficial impact of the project.

Operational dust clouds from NTC activities within the acquired area would typically stay north of I-15. Regional winds from the southwest would typically blow particulate dust emissions to the east of Death Valley, typically crossing Highway 127 between Silver Lake and Sperry Hills. This dust could raise PM-10 levels and obscure visibility across State Highway 127 and in the Dumont Dunes recreational area, thereby creating a significant impact. At its southernmost point, the project boundary is more than 5 miles from I-15 and would not create a significant visibility impact across the highway.

Reductions to existing exceedances of the PM-10 standard are considered a beneficial effect of this alternative.

4.8.2.2 Mitigation

No impacts for gaseous pollutants are predicted, and no mitigation for these emissions is warranted. Mitigation for visual and PM-10 impacts is as presented in Section 4.8.1.2.

4.8.3 Modified Coyote Basin Alternative

This alternative will involve acquiring approximately 259,470 acres. This value represents an increase of approximately 40 percent.

4.8.3.1 Impacts

Gaseous Emissions

Because no extensive modeling of vehicle movement patterns was developed for this alternative, any increase/decrease in mileage over existing conditions was developed in relation to the Proposed Action. Under the Proposed Action, AES concluded that vehicle mileage would be reduced by 8.4 percent of that projected for existing operations. Scaling off the distances as presented on Figure 1-1 of the AES study from both the cantonment area and proposed base camp area to the combat area shows a reduction of about 12 percent for the Proposed Action. Therefore, the ratio of the distance from a base camp to the combat area with respect to the existing distance provides a reasonable indicator of total mileage involved with each alternative and projected emissions.

Under the Modified Coyote Basin Alternative, land would be acquired to the east, southeast, south, southwest, and west. The potential placement of base camps to the east and southeast would reduce travel over that of the Proposed Action as well as the resultant emissions. Base camp placement to the south would produce roughly the same level of travel as

Table 4.8-2

EXISTING AND PROJECTED EMISSIONS FOR THE MODIFIED AVAWATZ-SILURIAN ALTERNATIVE[1]

Scenario	Carbon Monoxide (lb/day)	Nitrogen Oxides (lb/day)	Reactive Organic Gases (lb/day)	Sulfur Oxides (lb/day)	PM-10 Particulates (lb/day)
Existing Operations	972.1	289.7	128.4	14.6	23.3
With Project	890.6	263.8	117.6	13.3	21.3
Difference	-81.5	-25.9	-10.8	-1.3	-2.0
Yearly Savings (tons/yr)	7.3	2.3	1.0	0.1	0.2

[1] **Based on "running emissions" for both tracked and wheeled vehicles and does not include starts or aircraft support. Values are averaged per day for each of the 15 days of rotation.**

noted for the existing operations. However, the placement of a base camp to the southwest would extend travel distances, resulting in an increase in emissions. Because it is unknown where base camps would ultimately be placed and these could vary with the rotation, a worst-case scenario places the base camp to the southwest. It should be noted that expansion to the southwest for this alternative, as well as the Alvord Mountain, Superior Valley, and Avawatz Alternatives, will bring operations into the MDAQMD ozone nonattainment area that cuts across the southwest corner of Fort Irwin.

Reviewing potential routing around the Paradise Mountain Range shows this route to be roughly 20 percent longer than the existing route. Vehicle emissions are directly proportional to vehicle miles traveled. Based on the assumption that emissions are also increased by 20 percent less the 8.4 percent savings for the revised force-on-force operations, Table 4.8-3 presents the potential emissions associated with this alternative. Note that while all values are increased over existing levels, increases in carbon monoxide, nitrogen oxide, reative organic gas, and sulfer oxide (CO, NO_x, ROG, and SO_x, respectively) are below threshold values set by the MDAQMD for significance (i.e., 548 pounds per day for CO and 137 pounds per day for NO_x, ROG, and SO_x). Although PM-10 emissions from combustion would be well below its criterion value (i.e., 82 pounds per day), PM-10 from dust must also be included in this evaluation. These criteria levels (specifically NO_x and ROG) were developed to reduce exceedances of the ozone standards in MDAQMD nonattainment areas. Because additions to these pollutants fall below MDAQMD threshold values and are spread over a vast area, they will not result in a measurable air quality impact nor exceed federal or state ambient air quality standards.

Although the expansion will bring the boundary of the Fort to within 7 miles of Baker, 3 miles of Harvard, 6 miles of Yermo, and 12 miles of Barstow, the local winds typically blow from the southwest away from these receptors. With limited soil disturbances at the base camp, no offsite receptors will be exposed to air pollutant concentrations in excess of federal or state levels, and these receptors will not be significantly impacted. Similarly, due to the distances to the areas of acquisition from the cantonment area, onsite receptors will not be exposed to levels of pollutants that are any higher than those currently existing in the area.

Particulate Emissions

As with gaseous emissions, both dust and PM-10 emissions will ultimately vary with the placement of the base camp. Again, locations to the east and southeast would reduce these emissions over those predicted for the Proposed Action. Placement of a base camp to the south would result in a similar mileage; however, as demonstrated in the AES study,

Table 4.8-3

EXISTING AND PROJECTED EMISSIONS FOR THE MODIFIED COYOTE BASIN ALTERNATIVE[1]

Scenario	Carbon Monoxide (lb/day)	Nitrogen Oxides (lb/day)	Reactive Organic Gases (lb/day)	Sulfur Oxides (lb/day)	PM-10 Particulates (lb/day)
Existing Operations (No Action)	972.1	289.7	128.4	14.6	23.3
With Project	1,068.5	318.4	141.1	16.0	25.6
Difference	+96.4	+28.7	+12.7	+1.4	+2.3
Yearly Addition (tons/yr)	8.7	2.6	1.1	0.1	0.2

[1] **Based on "running emissions" for both tracked and wheeled vehicles and does not include starts or aircraft support. Values are averaged per day for each of the 15 days of rotation.**

the generation of dust is reduced for force-on-force exercises, and PM-10 emissions decrease from roughly 1.4 pounds per mile to 1.3 pounds per mile due mainly to reduced vehicle speeds. If base camps were placed to the south, total mileage would be roughly equivalent to that already produced onsite. Reductions in speed and force-on-force operations are estimated to reduce PM-10 by roughly 7 percent, and the resultant value is estimated at 380,642 pounds per rotation or 25,376 pounds per day. This represents a savings of about 28,650 pounds per rotation, 1,910 pounds per day, and 171.9 tons per year.

Placement of a base camp to the southwest would raise mileage by as much as 20 percent over existing operations. Total mileage per rotation could then reach 373,510. Again based on a value of 1.3 pounds of PM-10 per mile, as much as 485,562 pounds per rotation could be produced. This equates to an increase of 76,271 pounds per rotation or 5,085 pounds per day and would exceed the MDAQMD threshold level for PM-10. If all rotations were to use this base camp placement, PM-10 loading would increase 457.6 tons per year over existing emissions. This value exceeds the MDAQMD threshold of 82 pounds per day and would present a significant adverse impact for this alternative.

While operational dust clouds from NTC activities within the eastern area will stay mainly north of I-15 and south of Death Valley (typically crossing State Highway 127 between Silver Lake and Silurian Lake), dust emissions produced in the western area will typically be restricted to the existing Fort Irwin site with some emissions landing in the cantonment area. The dust generated in the Silurian area will raise PM-10 levels, but due to its extended distance from State Highway 127 will not create a significant visibility impact. Dust raised in the southern area is of concern because local winds are especially strong just west of the Cronese Lakes where wind funneling through a number of gaps in the Cronese Mountains may create wind jetting that may exacerbate the dust cloud and sand transport formation.

The topographic boundary provided by the Avawatz and Cronese Mountains, prevailing wind direction, and the minimum 7-mile distance between the expansion boundary and the City of Baker prevent direct increases in TSPs. Disturbance from activities in the Coyote Lake area could propagate southward during storms and increase dust and PM-10 loading in the Mojave Valley as far south as Newberry Springs. As with the Proposed Action, it is believed that a very low frequency of winds from the southeast toward the NAWS test range may provide some degradation of

range utility from this alternative. However, due to the extended distance, visibility will not be significantly impacted. At its southernmost point, the project area parallels I-15 for a distance of about 13 miles. Because the project boundary is located in excess of 4,000 feet along this length, it will not create a significant visibility impact across the highway.

4.8.3.2 Mitigation

No significant impacts for gaseous pollutants are predicted, and no mitigation for these emissions is warranted. Mitigation for visual and PM-10 emissions is as presented in Section 4.8.1.2. Depending on base camp placement, residual PM-10 values could continue to exceed the MDAQMD threshold level and the impact remains significant.

4.8.4 Alvord Mountain Alternative

This alternative will involve acquiring approximately 210,800 acres. Based on land area, the 210,800-acre value represents an increase of approximately 33 percent.

4.8.4.1 Impacts

Gaseous Emissions

Like the Modified Coyote Basin Alternative, land would be acquired to the east, southeast, south, and west but omit that portion to the southwest. Also like the Modified Coyote Basin Alternative, the potential placement of base camps to the east and southeast would reduce travel over that of the Proposed Action as well as the resultant emissions. Base camp placement to the south would produce roughly the same level of travel as noted for the existing operations. However, the placement of a base camp to the west would extend travel distances resulting in an increase in emissions. Here, a worst-case scenario places the base camp to the west. Reviewing potential routing shows this distance to be roughly 12 percent longer than the existing route. Based on the assumption that emissions are also increased by 12 percent less the 8.4 percent reduction for the modified force-on-force operations, Table 4.8-4 presents the potential emissions associated with this alternative. Note that while all values are increased over existing levels, all increases in gaseous emissions are below threshold values set by the MDAQMD for significance, and resultant emissions will not exceed either state or federal ambient concentrations and should not result in a measurable air quality impact.

The local winds typically blow from the southwest away from the receptors in major population centers. Therefore, no offsite receptors will be exposed to air pollutant concentrations in excess of federal or state levels, and these receptors will not be significantly impacted. Similarly, due to the distances to the areas of acquisition from the cantonment area, onsite receptors will not be exposed to levels of pollutants that are any higher than those currently existing in the area.

Particulate Emissions

Like the prior alternative, both dust and PM-10 emissions will ultimately vary with the placement of the base camp. Again, locations to the east and southeast would reduce these emissions over those predicted for the Proposed Action. Placement of a base camp to the south would result in a similar mileage; however, as demonstrated in the AES study, the generation of dust is reduced for force-on-force exercises and PM-10 emissions decrease from roughly 1.4 pounds per mile to 1.3 pounds per mile. Again based on a similar level of travel as predicted for existing operations, PM-10 is estimated at 380,642 pounds per rotation or 25,376 pounds per day. This represents a savings of about 28,650 pounds per rotation, 1,910 pounds per day, and 171.9 tons per year.

Placement of a base camp to the west would raise mileage by as much as 12 percent over existing operations. Total mileage per rotation could then reach 348,609. Again based on a value of 1.3 pounds of PM-10 per mile, as much as 453,192 pounds per rotation could be produced. This equates to an increase of 43,900 pounds per rotation or 2,927 pounds per day and would exceed the MDAQMD threshold level for PM-10. If all rotations were to use this base camp placement, PM-10 loading would increase 263.4 tons per year over existing emissions. This would then present a significant impact of this alternative.

Operational dust clouds from NTC activities within the eastern area will stay mainly north of I-15 and south of Death Valley (typically crossing State Highway 127 between Silver Lake and Silurian Lake). Due to its distance, no visibility impacts across State

Table 4.8-4

EXISTING AND PROJECTED EMISSIONS FOR THE ALVORD MOUNTAIN ALTERNATIVE[1]

Scenario	Carbon Monoxide (lb/day)	Nitrogen Oxides (lb/day)	Reactive Organic Gases (lb/day)	Sulfur Oxides (lb/day)	PM-10 Particulates (lb/day)
Existing Operations (No Action)	972.1	289.7	128.4	14.6	23.3
With Project	997.3	297.2	131.7	15.0	23.9
Difference	+25.2	+7.5	+3.3	+0.4	+0.6
Yearly Addition (tons/yr)	2.3	0.7	0.3	0.0	0.1

[1] **Based on "running emissions" for both tracked and wheeled vehicles and does not include starts or aircraft support. Values are averaged per day for each of the 15 days of rotation.**

Highway 127 are predicted. Dust raised in the southern area is of concern because local winds are especially strong just west of the Cronese Lakes where wind funneling through a number of gaps in the Cronese Mountains may create wind jetting that may exacerbate the dust cloud and sand transport formation. The topographic boundary provided by the Avawatz and Cronese Mountains, prevailing wind direction, and the minimum 11-mile distance between the expansion boundary and the City of Baker prevent direct increases in TSPs. Dust emissions produced in the southwestern area will be restricted to the existing Fort Irwin site and will pass south of the cantonment area. Furthermore, this dust will not be expected to affect the area around Coyote Lake to the west. Operations adjacent to I-15 would not be expected to significantly obscure vision along the highway because the 13 miles of expansion area along the highway are in excess of 4,000 feet.

Contributions to existing exceedances of the PM-10 standard are considered a significant unavoidable adverse impact of this alternative. Smaller particles may drift farther and contribute to measured exceedances at SEDAB monitoring stations.

4.8.4.2 Mitigation

No significant impacts for gaseous pollutants are predicted, and no mitigation for these emissions is warranted. Mitigation for visual and PM-10 emissions is as presented in Section 4.8.1.2. Depending on base camp placement, residual PM-10 values could continue to exceed the MDAQMD threshold level and the impact remains significant.

4.8.5 Superior Valley Alternative

This alternative will involve acquisition of approximately 284,885 acres. The 284,885-acre value represents an increase of approximately 44 percent. Although some area may be lost to the southeast, the potential placement for base camps is slightly greater than of the Modified Coyote Basin Alternative. These areas are then used to predict additional emissions over the existing emissions.

4.8.5.1 Impacts

Gaseous Emissions

Like the Modified Coyote Basin Alternative, land would be acquired to the east, southeast, south, and

west, but omit a portion to the southeast and slightly expand the area to the west. Also like the Modified Coyote Basin Alternative, the potential placement of base camps to the east would reduce travel over that of the Proposed Action as well as the resultant emissions. Base camp placement to the south would produce roughly the same level of travel as noted for the existing operations. However, the placement of a base camp to the west would extend travel distances, resulting in an increase in emissions. Routing from a camp in this area could extend travel distances roughly 25 percent over those currently in use. Based on the assumption that emissions are also increased by 25 percent less the 8.4 percent for the revised force-on-force operations, Table 4.8-5 presents the potential emissions associated with this alternative. Note that while all values are increased over existing levels, all increases in gaseous emissions are below threshold values set by the MDAQMD for significance, and resultant emissions will not exceed either state or federal ambient concentrations and should not result in a measurable air quality impact.

Although the expansion will bring the boundary of Fort Irwin to a distance of approximately 10 miles from Baker, the distances predicted for Harvard, Yermo, and Barstow will be similar to those predicted for the Modified Coyote Basin Alternative. Again, because the local winds typically blow from the southwest away from these receptors, no offsite receptors will be exposed to air pollutant concentrations in excess of federal or state levels, and no significant impacts are predicted. Similarly, due to the distances to the areas of acquisition from the cantonment area, onsite receptors will not be exposed to levels of pollutants that are any higher than those currently existing in the area.

Particulate Emissions

Due to an augmental area for expansion and placement of base camps, particulate emissions are projected to be higher than those projected for the existing operations. With a worst-case base camp placement, total mileage per rotation could reach 389,073, and as much as 505,794 pounds of PM-10 per rotation could be produced. This equates to an increase of 96,502 pounds per rotation or 6,433 pounds per day and would exceed the MDAQMD threshold level for PM-10. If all rotations were to use this base camp placement, PM-10 loading would increase 579.0 tons per year over existing emissions. This would then present a significant adverse impact of this alternative.

This alternative maintains a suitable buffer south of the power line, but shifts possible primary and secondary dust formation processes into the Superior Valley where NAWS operations could be affected. It is believed that there is a very low frequency of winds from the southeast toward the NAWS test range, but some degradation of range utility could occur from this alternative. Additionally, this alternative adds buffer to I-15 because the nearest boundary is extended to a distance in excess of 14,500 feet.

Exceedance of the PM-10 standard for an area extending 2 miles from any disturbance activity during the day and 9 miles from the activity site at night is considered a significant, unavoidable adverse impact of this alternative.

4.8.5.2 Mitigation

No significant impacts for gaseous pollutants are predicted, and no mitigation for these emissions is warranted. Impacts associated with the NAWS area will be mitigated to a level of nonsignificance through a coordinated effort between the NTC and the NAWS. Mitigation for visual and PM-10 emissions is as presented in Section 4.8.1.2. Depending on base camp placement, residual PM-10 values could continue to exceed the MDAQMD threshold level and the impact remains significant.

4.8.6 Avawatz Alternative

This alternative will involve acquiring approximately 185,500 acres. This value represents an increase of approximately 29 percent. With the exception of some additional area to the southwest and the removal of some area to the southeast, this alternative is very similar to the Alvord Alternative.

4.8.6.1 Impacts

Gaseous Emissions

Like the Alvord Alternative, the potential placement of base camps to the east would reduce travel over that of the Proposed Action as well as the resultant emissions. Base camp placement to the south would produce roughly the same level of travel as noted for the existing operations. However, the placement of a base camp to the west would extend travel distances, resulting in an increase in emissions. Based on a

Table 4.8-5

EXISTING AND PROJECTED EMISSIONS FOR THE SUPERIOR VALLEY ALTERNATIVE[1]

Scenario	Carbon Monoxide (lb/day)	Nitrogen Oxides (lb/day)	Reactive Organic Gases (lb/day)	Sulfur Oxides (lb/day)	PM-10 Particulates (lb/day)
Existing Operations (No Action)	972.1	289.7	128.4	14.6	23.3
With Project	1,113.3	331.7	147.0	16.7	26.7
Difference	+140.9	+42.0	+18.6	+32.1	+3.4
Yearly Addition (tons/yr)	12.7	3.8	1.7	0.2	0.3

[1] **Based on "running emissions" for both tracked and wheeled vehicles and does not include starts or aircraft support. Values are averaged per day for each of the 15 days of rotation.**

similar based camp placement as used for the Alvord Alternative, this distance to be roughly 12 percent longer than the existing route. Based on the assumption that emissions are also increased by 12 percent less the 8.4 percent for the revised force-on-force operations, Table 4.8-6 presents the potential emissions associated with this alternative. Note that while all values are increased over existing levels, all increases are below threshold values set by the MDAQMD for significance and these emissions will not result in an exceedance of either the state or federal ambient concentrations or present a measurable air quality impact.

Emissions are spread over a greater area and will not violate state or federal AAQS and therefore are not considered significant. The distances to major population centers are as described in the Superior Valley Alternative. Again, the local winds typically blow from the southwest away from these receptors, no offsite receptors will be exposed to air pollutant concentrations in excess of federal or state levels, and no significant impacts are predicted. Similarly, due to distances to the areas of acquisition from the cantonment area, onsite receptors will not be exposed to levels of pollutants that are any higher than those currently existing in the area.

Particulate Emissions

Like the other alternatives, both dust and PM-10 emissions will ultimately vary with the placement of the base camp. Again, locations to the east would reduce these emissions over those predicted for the Proposed Action. Locations to the south could result in an emissions' savings over current operations due to the force-on-force arms engagement.

Placement of a base camp to the west would raise mileage by as much as 12 percent over existing operations. Total mileage per rotation could then reach 348,609. Again based on a value of 1.3 pounds of PM-10 per mile, as much as 453,192 pounds per rotation could be produced. This equates to an increase of 43,900 pounds per rotation or 2,927 pounds per day and would exceed the MDAQMD threshold level for PM-10. If all rotations were to use this base camp placement, PM-10 loading would increase 263.4 tons per year over existing emissions. This would then present a significant adverse impact of this alternative.

Table 4.8-6

EXISTING AND PROJECTED EMISSIONS FOR THE AVAWATZ ALTERNATIVE[1]

Scenario	Carbon Monoxide (lb/day)	Nitrogen Oxides (lb/day)	Reactive Organic Gases (lb/day)	Sulfur Oxides (lb/day)	PM-10 Particulates (lb/day)
Existing Operations (No Action)	972.1	289.7	128.4	14.6	23.3
With Project	997.3	297.2	131.7	15.0	23.9
Difference	+25.2	+7.5	+3.3	+0.4	+0.6
Yearly Addition (tons/yr)	2.3	0.7	0.3	0.0	0.1

[1] **Based on "running emissions" for both tracked and wheeled vehicles and does not include starts or aircraft support. Values are averaged per day for each of the 15 days of rotation.**

This alternative also maintains a suitable buffer south of the power line and avoids the Cronese Lake area where wind funneling effects could be important. Due to its distance from State Highway 127, no visibility impacts are predicted. Furthermore, it maintains the greatest buffer (i.e., more that 14,500 feet) from I-15.

Exceedance of the PM-10 standard is considered a significant, unavoidable adverse impact of this alternative.

4.8.6.2 Mitigation

No significant impacts for gaseous pollutants are predicted, and no mitigation for these emissions is warranted. Mitigation for visual and PM-10 emissions is as presented in Section 4.8.1.2. Depending on base camp placement, residual PM-10 values could continue to exceed the MDAQMD threshold level and the impact remains significant.

4.8.7 No Action Alternative

4.8.7.1 Impacts

In accordance with this alternative, no additional land will be acquired. Training exercises will continue as they have been and are not anticipated to change. No new or augmented emissions will be generated, and no significant impacts will be produced. The following discussion is presented so that the impacts associated with the various other alternatives may be derived.

All emissions, both gaseous and PM-10, would be as predicted for existing operations as described in Section 4.8.1. Because this alternative will not result in any additional land acquisition or changes in operational procedures, emissions will not change and no significant impact will occur.

4.8.7.2 Mitigation

No significant impacts are associated with the No Action Alternative, and no mitigation is warranted.

4.8.8 Cumulative Impacts

Implementation of the cumulative projects will result in substantial degradation of air quality on a regional basis from both increased urbanization and other activities. With most of the cumulative projects (HVR, Hector Mine Expansion, Broadwell, Cycle Rail, Ward Valley, and Fort Cady), heavy equipment usage would be the major onsite pollutant source. It is expected that with these projects, the construction and operation equipment exhaust emissions, including

the onsite transport of soil, refuse, and so forth would come as close as possible to the maximum allowable emissions set forth for each site. The cumulative projects are also expected to contribute to offsite emissions with an increase in vehicular trips, especially truck and train. On an individual basis, the cumulative projects are expected to comply with AAQS. There is a potential for the cumulative emissions to exceed the AAQS for nitrogen oxides and other pollutants of concern for the overall area. Degradation of the local airshed would result in a significant impact. The Proposed Action is in compliance with onsite emissions and is expected to reduce local emission, both gaseous and particulate. As such, it could incrementally reduce this impact.

Cumulative dust generation from physical disturbance, onsite waste and materials movement and processing, and wind erosion during high wind episodes would create a visual and soiling nuisance beyond the boundaries for the various projects. The Proposed Action within the proposed acquisition lands will create significant particulate (PM-10) emissions, contributing to a significant cumulative impact. Operation of tracked and wheeled vehicles will loft dust and helicopter operation on the ground and, at low altitudes, will raise substantial dust clouds. Also, the loss of vegetation and the destruction of desert pavement will increase the potential for windblown dust emissions on a long-term basis.

In addition to local, state, and federal ambient air quality standards, federal projects such as that proposed are subject to a federal conformity analysis if they lie in a nonattainment area. Because the Proposed Action is located in a PM-10 nonattainment area, it may be subject to a conformity analysis. The conformity process is a procedure required by the Federal Clean Air Act (40 CFR Part 51) to determine whether or not a federal project meets the requirements of the State Implementation Plan for air emissions. This analysis, provided by AES and reviewed by the MDAQMD, concluded that the Proposed Action does meet the conformity requirements.

4.8.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.8-7. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.8-8.

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Table 4.8-7

AIR QUALITY - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Beneficial reduction in dust emission; less 200 tons per year PM-10 particulates. Significant visibility impact on Highway 127.	Beneficial reduction in dust emission; less 200 tons per year PM-10 particulates. Significant visibility impact on Highway 127.	Significant increase in dust emission; addition of 579 tons per year PM-10 particulates.	Significant increase in dust emission; addition of 263 tons per year PM-10 particulates.	Significant increase in dust emission; addition of 579 tons per year PM-10 particulates.	Significant increase in dust emission; addition of 263 tons per year PM-10 particulates.	No significant impacts. No change to existing emissions.

Table 4.8-8

AIR QUALITY - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Visibility impacts on Highway 127 reduced to not significant.	Visibility impacts on Highway 127 reduced to not significant.	Dust emission impact remains significant.	Dust emission impact remains significant.	Dust emission impact remains significant.	Dust emission impact remains significant.

4.9 NOISE

Determining a significant noise impact was based on Army Regulation 200-1, which implements all federal laws concerning environmental noise for Department of the Army activities. This regulation specifies that a noise level of 65 to 75 dBA is normally acceptable, while a noise level of greater than 75 dBA is unacceptable. A significant noise impact was defined as a noise level of greater than 75 dBA at the location of any sensitive receptors.

4.9.1 Proposed Action

4.9.1.1 Impacts

Noise impacts associated with the Proposed Action are expected to be minimal because of the lack of noise-sensitive receptors within the project vicinity. The construction of undercrossings along State Highway 127 will produce noise, but is not expected to exceed 89 dBA noise equivalent level (Leq) as measured at a distance of 50 feet (EPA 1971). Construction activities will typically be limited to daylight hours. Based on the assumption of 12 hours of construction during the day, the Ldn for these activities will be approximately 86 dBA as measured at a distance of 50 feet. The Ldn in Baker from construction activities could be on the order of 26 dBA if a crossing were placed at the perimeter of the acquisition area. This value would be further attenuated by any changes in terrain elevation, and no significant impacts will be produced.

Similarly, construction of any camera towers or observation platforms is anticipated to create an Ldn of 86 dBA at 50 feet. The 75-dBA Ldn will occur at a distance of approximately 177 feet from the area of construction. This is much closer than any sensitive receptors, and this construction will not produce any significant impacts.

Upon completion of the undercrossings across State Highway 127, military vehicles could start to use the Silurian area. As discussed in Section 3.1.9.2, rolling stock will create noise, but is not anticipated to exceed 90 dBA Leq at a distance of 100 feet from the nearest vehicle.

The nearest offsite population center (Baker) is located approximately 7 miles southeast at its nearest point but is effectively shielded by the Soda Mountains at this point. A pass from the site to Baker occurs along State Highway 127, and the site is approximately 9 miles along this route. Based on line-of-sight noise propagation, the noise level in Baker from maneuvering exercises at this location will be on the order of 36 dBA Leq. A worst-case scenario assumes 24 hours of continuous operation for an Ldn of 42 dBA in Baker, and no significant impacts would be produced. In addition, grade changes in the terrain that separates the expansion area from the city will further reduce this noise. Any residences located within the project boundaries will be relocated and not impacted. See Figure 3.9-1 for populations centers.

Based on a noise level of 140 dBA as measured at a distance of 50 feet, the noise produced by the operation of aircraft in the Silurian Valley will be attenuated to a level of approximately 80 dBA in the Baker area based solely on atmospheric attenuation. The Ldn will be governed by the level and hours of activity. To exceed the 75-dBA Ldn, jet aircraft will require 7 hours of operation in this location between the hours of 7:00 a.m. and 10:00 p.m. or 40 minutes of operation between the hours of 10:00 p.m. and 7:00 a.m. (or some combination thereof). Each time that the number of aircraft in simultaneous use is doubled, the allowable duration is halved. Because air operations are typically confined to sorties of limited duration, these extended hours in proximity to Baker are not anticipated, and no significant impacts will be produced. Similarly, helicopter operations will not be conducted for this extended timeframe and, because helicopters are quieter than jets, they will not produce a significant impact. Additionally, air operations located close to the ground surface will typically receive additional attenuation from the intervening mountainous terrain.

Another potential source of noise impact is from the live firing of cannons. As discussed in Section 3.9.1.2, cannon fire attenuates at a rate of approximately 9.6 dBA per doubling of the distance. All live-fire operations are to be conducted north of the Granite Mountains in excess of 20 miles from Baker. Based on line-of-sight attenuation, the impulse noise from a single cannon will be approximately 84 dBA in Baker. The use of multiple cannons will probably not exceed 90 dBA at this location. However, the intervening mountains will further attenuate this noise, and the resultant noise in Baker will be below the 75-dBA Ldn significance criterion. Furthermore, all live firing will take place within the existing confines of Fort Irwin and will not occur in

the expansion area for this or any other alternative. Thus, this live firing is not considered a part of this action.

Other offsite receptors located in proximity to the project site include residents in Yermo at approximately 24 miles, Barstow at approximately 34 miles, and a few scattered residences in Harvard at approximately 15 miles from the site, all at their nearest points. Noise levels at these locations will be less than predicted at Baker by virtue of their extended distances as well as intervening topographic features. These receptors will not be significantly impacted.

The residents living onsite who are most exposed to any increase in noise levels are within the existing cantonment area. This area is located approximately 15 miles northwest of the western boundary of the southeasternmost portion of the acquisition area. Based on the same methodology as presented for receptors in Baker and excluding additional attenuation from topographic features, vehicles will produce an Leq of about 32 dBA. The Ldn level from 24 hours of continuous operation at this point will be 38 dBA and will not exceed the significance criteria. Aircraft noise will be on the order of 76 dBA Leq. The 75-dBA Ldn will require approximately 16 hours of use between the hours of 7:00 a.m. and 10:00 p.m. and 0.5 hour of use between the hours of 10:00 p.m. and 7:00 a.m. or approximately 2 hours of use between the hours of 10:00 p.m. and 7:00 a.m. Again, this level of aircraft activity will not be expected, and no significant impacts will be produced. As with offsite receptors, cannon fire north of the Granite Mountains will be effectively attenuated by the steep terrain, and no impacts will result from these operations and therefore will not be addressed further in this document.

4.9.1.2 Mitigation

No significant impacts have been identified, and no mitigation is necessary. However, should any existing residents located in proximity to the boundary of the acquisition area experience excessive noise levels, the Army is committed to, on a case-by-case basis, respond to any complaints of noise by monitoring noise levels and taking appropriate remedial action in accordance with AR 200-1.

4.9.2 Modified Avawatz-Silurian Alternative

4.9.2.1 Impacts

This alternative would move the nearest boundary to the northeast edge of the study area and about 9 miles from Baker. Impacts at Baker would be similar to the Proposed Project and will not be significant. This alternative would not move Fort Irwin training operations closer to Harvard or Yermo, and noise impacts in these areas would be similar to those predicted for the No Action Alternative (Section 4.9.7).

In this alternative, the cantonment area would be located approximately 15 miles from the nearest expansion border to the southeast. Noise levels from ground-based operations could reach an Leq of 32 dBA. An Ldn of 38 dBA would be produced from 24 hours of continuous operation (and would be further attenuated by virtue of the intervening terrain) and would not produce a significant impact in this area.

4.9.2.2 Mitigation

With the exception of any possible residents located near the expansion border, no significant impacts are associated with this alternative. Mitigation for existing residents located in proximity to the project area expansion border will be handled on a case-by-case basis. A representative from Ft. Irwin will be appointed to respond to any complaints of noise by monitoring noise levels and taking appropriate remedial action in accordance with AR 200-1.

4.9.3 Modified Coyote Basin Alternative

4.9.3.1 Impacts

Under this alternative, the closest offsite receptors will be those residents located in Harvard, which is approximately 3 miles south of the southern terminus of the proposed expansion area. Based on the methodology presented in Section 4.9.1, the noise from land-based vehicles will be approximately 46 dBA Leq. Based on 24 hours of continuous operations (a worst-case scenario), the Ldn will be 52 dBA, and no significant impacts will be produced. Noise impacts in Baker will be similar to those predicted for the Proposed Action and will not create a significant impact. Yermo and Barstow, located at

distances of 6 and 12 miles, respectively, at their nearest points, will be anticipated to receive less noise than Baker because of the intervening Calico Mountains, and noise in these locations will not create significant impacts.

In this alternative, the cantonment area will be located approximately 7 miles from the nearest expansion border to the west. Noise levels from ground-based operations will reach an Leq of 39 dBA. An Ldn of 45 dBA will be produced from 24 hours of continuous operation (and will be further attenuated by virtue of the intervening terrain) and will not produce a significant impact in this area.

Increased aircraft operations due to extended training exercises may intermittently increase noise levels for those residents living within the Harvard area and in the cantonment area of Fort Irwin. The noise from a single jet operating at the southern boundary is calculated at 90 dBA Leq in the Harvard area. Approximately 45 minutes of operation for a single jet between the hours of 7:00 a.m. and 10 p.m. or 5 minutes of jet operations between the hours of 10:00 p.m. and 7:00 a.m. will produce an Ldn of 75 dBA. Although daytime operations are not anticipated to exceed 45 minutes, night operations could exceed 5 minutes in duration, and a potential significant impact is predicted. Furthermore, for the simultaneous operation of more than one jet, the allotted time in this area is reduced such that two jets in simultaneous operation could only be used for 2.5 minutes, four jets for 1.25 minutes, and so forth before a significant impact is produced. Jet noise in the Baker area will be as predicted in the Proposed Action and will not create a significant impact. Again, Yermo and Barstow, located at distances of 6 and 12 miles, respectively, at their nearest points, will be anticipated to receive less noise than Baker because of the intervening Calico Mountains, and noise in these locations will not create significant impacts.

Jet noise in the cantonment area could reach an Leq of 82 dBA for a single aircraft. A 75-dBA Ldn will be incurred after approximately 5 hours of continuous operation between the hours of 7:00 a.m. and 10:00 p.m. or about 30 minutes of operation between the hours of 10:00 p.m. and 7:00 a.m. Again, each time the number of jets in simultaneous use is doubled, the time is halved to attain the same Ldn. These operations are not anticipated to exceed these time restrictions, and no significant impacts are expected in the cantonment area.

4.9.3.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of funding:

1. Jet operations in the southern terminus of the Modified Coyote Basin Alternative near the Harvard area shall be limited to 45 minutes of single jet operation between the hours of 7:00 a.m. and 10:00 p.m. and no jet operation in this area between the hours of 10:00 p.m. and 7:00 a.m.

Should any existing residences located in proximity to the land acquisition border experience excessive noise levels, the Army is committed to, on a case-by-case basis, respond to any complaints of noise by monitoring noise levels and taking appropriate remedial action in accordance with AR 200-1.

4.9.4 Alvord Alternative

4.9.4.1 Impacts

Under this alternative, impacts on receptors located in Baker, Harvard, and the cantonment area will be similar to the Modified Coyote Basin Alternative. Neither Baker nor the cantonment area will be significantly impacted. However, Harvard will potentially be significantly impacted. Receptors located in Yermo and Barstow will be situated at distances of 11 and 20 miles at their nearest points, respectively, and will not be significantly impacted.

4.9.4.2 Mitigation

Mitigations are the same as those for Modified Coyote Basin Alternative.

4.9.5 Superior Valley Alternative

4.9.5.1 Impacts

This alternative will place the nearest boundary approximately 10 miles from Baker, and the city will not be significantly impacted. The nearest offsite receptors will still be located in Harvard, which is approximately 3 miles to the south of the expansion. Again, Yermo and Barstow will be located at distances of 6 and 12 miles, respectively, at their nearest points

and are effectively shielded by the Calico Mountains. Furthermore, the cantonment area will again be located approximately 7 miles from the expansion area. All impacts will be as predicted for the Modified Coyote Basin Alternative.

4.9.5.2 Mitigation

Mitigation will be the same as that for the Modified Coyote Basin Alternative.

4.9.6 Avawatz Alternative

4.9.6.1 Impacts

This alternative will place the nearest boundary approximately 10 miles from Baker. Although the distance to Yermo will remain at about 6 miles, the distance to Barstow will be increased to about 14 miles. The nearest offsite receptors will still be located in Harvard, approximately 3 miles south of the expansion. Furthermore, the cantonment area will still be located approximately 7 miles from the expansion area. Impacts will be the same as those predicted for the Modified Coyote Basin Alternative.

4.9.6.2 Mitigation

Mitigation will be the same as that for the Modified Coyote Basin Alternative.

4.9.7 No Action Alternative

Except for the occasional sonic booms generated from the supersonic air corridor in the southern section of the base and complaints from a limited number of Harvard area residents due to noise from helicopter and aircraft operations at the NTC, existing noise disturbances have not drawn the public's interest because of the remoteness of Fort Irwin from populated areas. Existing conditions will continue under the No Action Alternative, and no significant impacts will be produced.

4.9.8 Cumulative Impacts

The cumulative projects may contribute to an increase in traffic and associated noise levels, primarily from the Barstow area on the I-40. The Proposed Action will not increase the existing levels of troop transportation on area highways and therefore will not contribute to any cumulative increase in traffic noise.

With the Proposed Action, land and air operations will not appreciably increase over present levels, but the use of additional areas for training will spread these levels over a greater area. Due to the combined distance to the nearest offsite receptors and the intervening mountainous terrain, these noise sources are not expected to add to any cumulative noise levels.

4.9.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.9-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.9-2.

Table 4.9-1

NOISE - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
No significant impact.	No significant impact.	Potential significant noise impact from aircraft on receptors in Harvard.	Potential significant noise impact from aircraft on receptors in Harvard.	Potential significant noise impact from aircraft on receptors in Harvard.	Potential significant noise impact from aircraft on receptors in Harvard.	No impact.

Table 4.9-2

NOISE - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.

4.10 LAND USE

A significant impact on land use will occur if there is:

- inconsistency with applicable federal, state, and local land use policies, plans, designations, and zoning;
- loss of availability of public land grazing allotments for lease holders within the Western Mojave Region such that a substantial change in the business operation of the lease holder will occur or if cancellation of grazing leases will occur;
- loss of ability to have or acquire an isolated residence within a region or the loss of 1 percent of the existing residences within 50 miles of Barstow;
- loss of prime or unique farmlands or farmlands of statewide or local importance;
- loss of the opportunity to practice a religion or experience an important component of that religious order; and/or
- incompatibility with adjacent land uses such that existing uses are precluded or eliminated.

4.10.1 Proposed Action

4.10.1.1 Impacts

Federal/Public Land

Table 4.10-1 presents the amount of public land to be withdrawn for the Proposed Action and each of the other alternatives. The relative acres of state and private lands to be acquired are also given. No existing military land is proposed for acquisition.

The Proposed Action will result in expansion of the NTC and the withdrawal and acquisition of 331,217 acres of land surrounding the existing NTC at Fort Irwin. The Proposed Action is mostly comprised of the Silurian Valley portion of the study area and part of the southern portion from north of Dunn Road north to the Iron Mountain Mine in the Avawatz Mountains.

Implementation of the Proposed Action will result in the acquisition of 5,148 acres of private lands 15,773 acres of state lands, and the withdrawal of 310,296 acres of public lands for management and use by the military. Withdrawal of public lands from direct BLM management for sole use by the U.S. Army will require an amendment to the CDCA Plan to remove specific areas from public use. The amendment process, including environmental review, is discussed in detail in Section 1.2. Military management and use of federal lands of the CDCA will increase from 3.6 to 3.9 million acres. Additional information on other military uses of the CDCA is presented in Appendix 9 of Michael Brandman Associates (MBA) 1991.

Table 4.10-1

LAND OWNERSHIP

Alternative	BLM/Public Domain (acres)	State (acres)	Private (acres)	Total (acres)
Proposed Action	310,296	15,773	5,148	331,217
Modified Avawatz-Silurian Alternative	253,300	12,350	4,380	270,030
Modified Coyote Basin	196,914	4,745	57,811	259,470
Alvord	168,700	4,800	37,300	210,800
Superior Valley	202,254	3,331	79,300	284,885
Avawatz	137,600	2,000	45,900	185,500
Total Study Area	505,938	21,416	94,616	621,970

Sources: MBA 1991; Chambers Group 1991b, 1993

Wilderness Study Area Interim Management

Approval and implementation of the Proposed Action would remove approximately 181,920 acres of public lands in five legislatively designated WSAs. These include the Avawatz Mountains, South Avawatz Mountains, Soda Mountains, Kingston Range, and Death Valley National Park Boundary WSAs. Current administration of those WSAs under the BLM "Interim Management Policy and Guidelines for Lands Under Wilderness Review, July 1995" to maintain the area's suitability for preservation as wilderness would cease. The inconsistency of the Proposed Action with the current WSA Interim Management Policy and Guidelines is defined as a significant impact.

Western Mojave Land Tenure Adjustment

No WMLTA Project lands will be affected under this alternative.

Multiple-Use Classifications, ACECs, and UPAs

Previous BLM multiple-use classifications will no longer apply because the lands will be under management of the U.S. Army. Current uses, including recreational, preservation of cultural resource sites, commercial filming at Silurian Lake, and protection of riparian uses will be precluded by the proposed military activities. The public lands acquired for military operations in this alternative would include lands designated as the Salt Creek Hills and Denning Spring ACECs in the Silurian Valley. Military operations will conflict with existing BLM management plans for the important environmental resources present in these areas, resulting in a potential significant impact.

Livestock Grazing

Table 4.10-2 presents the potential loss of allotment acreage and livestock forage allocation for the Proposed Action and other alternatives.

The Proposed Action will result in a withdrawal of public land from the Cronese Lake allotment. The cancellation of the grazing lease for the Cronese Lake allotment will be a significant adverse impact on the leaseholder. Tom and Jeanne Wetterman, who holds the grazing privileges on the Cronese Lake allotment, will lose 812 animal unit months (AUMs) on 29,200 acres of public land. They will also lose the use of intermingled private and state land currently under lease. The reductions in allotment acreage and livestock forage are less than the reductions resulting from the other alternatives because the Superior Valley and Goldstone allotments are not located within this alternative and will not be impacted.

No other available grazing areas are located within the region; therefore, transfer of grazing rights to other public lands will not be a viable mitigation measure. For the affected cattle allotment (Cronese Lake), the leaseholders will need to find year-round range and forage for their livestock also adjacent to their home ranches. No other year-round allotments are available for this transfer of use on public lands adjacent to the leaseholder's ranch nor is there likely to be any year-round cattle allotment available on public lands within the entire southern California area. If the leaseholders desire to find and purchase other livestock grazing operations within public land leases, they will be responsible for all the arrangements and will bear all costs.

Actual cancellation of a lease will require a grazing decision pursuant to 43 CFR 4110.4-2 (decrease in land acreage) and 43 CFR 4160 (administrative remedies). It should be noted that, beyond the 2-year notification process prior to cancellation and payment for the fair market value of any range improvements occurring on public lands that belong to the leaseholders, no other consideration is provided to the leaseholders with loss of grazing privileges. Therefore, no mitigation is available that will reduce this alternative's impact on leaseholders' operations to nonsignificance. Impacts will remain significant.

While the impacts on the individual leaseholders are significant and unavoidable, there will not be a significant impact on the regional economy with loss or reduction of these livestock operations.

State Lands

In general, because of the preponderance of public lands involved in the alternatives, including the Proposed Action, Congressional approval to withdraw public lands for military uses will facilitate the acquisition of intermingled state (and private) land. Under this alternative, 15,773 acres of state land scattered throughout the Silurian Valley and part of the

southern portion of the alternative area will be acquired for transfer for U.S. Army use. Management authority will be transferred from the SLC and other applicable state agencies to the U.S. Army. No significant impacts are expected.

Private Lands

Private lands make up approximately 2 percent of the lands within the Proposed Action and are scattered throughout the Silurian Valley. Under this alternative, 5,148 acres of private land will be acquired for transfer to U.S. Army use and management. No significant impacts are expected.

Residential Uses

Two existing residential structures have been observed within the boundaries of the Proposed Action. Acquisition of these lands will involve condemnation and purchase by the Army and relocation assistance. The acquisition of property and relocation of the occupants from residences will result in a short-term significant impact on the individual landowners. There will be no significant regional impact on housing supply or the opportunity to have an isolated residential parcel within 50 miles of Barstow, because the location of the Proposed Action is further than 50 miles from Barstow.

Agriculture

No prime farmlands or farmlands of statewide or local importance will be impacted by the Proposed Action. No significant impacts are expected.

Uses by Religious Organizations

The St. Anthony Coptic Orthodox Monastery is located outside of the boundaries of the Proposed Action. No significant impacts are expected.

Table 4.10-2

POTENTIAL LOSS OF ALLOTMENT ACREAGE AND LIVESTOCK FORAGE BY ALTERNATIVE

Alternative	Allotment (acres)		
	Cronese Lake	Superior Valley	Goldstone
Proposed Action			
Public Land Acres	29,200	0	0
Forage (AUMs)	812	0	0
Modified Avawatz-Silurian			
Public Land Acres	490	0	0
Forage (AUMs)	14	0	0
Modified Coyote Basin			
Public Land Acres	36,900	51,840	9,006
Forage (AUMs)	1,025	965	572
Alvord Mountain			
Public Land Acres	36,900	23,680	9,006
Forage (AUMs)	1,025	317	572
Superior Valley			
Public Land Acres	3,800	105,300	9,006
Forage (AUMs)	105	1,411	572
Avawatz			
Public Land Acres	3,800	28,800	9,006
Forage (AUMs)	105	386	572
Source: MBA 1991			

Adjacent Uses

Nine residences are located adjacent to the southern boundary of the study area near the power line corridor and north of Harvard. These residences are located approximately 15 miles southwest of the Proposed Action boundary and about 5 miles south of the existing southern boundary of Fort Irwin. Upon adoption of this alternative, these residences are not expected to be substantially affected by the proposed NTC operations. Land use incompatibility between the residential properties and military activities in the southern portion of the Proposed Action area will be less than significant.

Environmental Justice

Residential uses in the study area are relatively scarce. Review and evaluation of economic, social, and health information from statistical databases and input from local groups/communities during the public involvement phase have not disclosed the existence of identifiable minority or low-income communities in the vicinity of Fort Irwin. The Army's Proposed Action is not designed to create a benefit for any group or individual. Acquisition of additional lands to support the training mission of the NTC does not create disproportionately high or adverse human health or environmental impacts on minority or low-income populations of the surrounding community. Land acquisition activities should not have disporportionate adverse effects on minority or low-income communities. No significant impacts are expected.

4.10.1.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of NTC funding:

1. A public access policy will be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area as is presently done on the existing NTC. Access will also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, off-road vehicles, etc.

4.10.2 Modified Avawatz-Silurian Alternative

4.10.2.1 Impacts

Federal/Public Lands

Implementation of the Modified Avawatz-Silurian Alternative will result in the acquisition of 4,380 acres of private land and 12,350 acres of state lands, and the withdrawal of 253,300 acres of public lands for management and use by the military. Military management and use of federal lands of the CDC will increase from 3.6 to 3.87 million acres.

Wilderness Study Area Interim Management

Approval and implementation of this alternative would remove approximately 141,600 acres of public lands in four legislatively designated WSAs. These include the Avawatz Mountains, South Avawatz Mountains, Kingston Range, and Death Valley National Park Boundary WSAs. Current administration of those WSAs under the BLM Interim Management Policy to maintain the area's suitability for preservation as wilderness would cease. The inconsistency of this alternative with the current Wilderness Study Area Interim Management Policy and Guidelines is defined as a significant impact.

Western Mojave Land Tenure Adjustment

No WMLTA Project lands will be affected under this alternative.

Multiple-Use Classifications, ACECs, and UPAs

Current BLM multiple-use classifications will no longer apply because the lands will be under management of the U.S. Army. Impacts on existing land uses will be similar to those discussed for the Proposed Action. The Modified Avawatz-Silurian Alternative would not include public lands designated as the Salt Creek Hills and Denning Spring ACECs in the Silurian Valley.

Livestock Grazing

The Modified Avawatz-Silurian Alternative will result in the withdrawal of a small amount of public land from the Cronese Lake allotment. Tom and Jeanne Wetterman, who hold the grazing privileges on the Cronese Lake allotment, will lose 14 AUMs on approximately 490 acres of public lands. Because the majority of the allotment will not be lost, this will result in a less than significant impact.

State Lands

Under the Modified Avawatz-Silurian Alternative, 12,350 acres of state land will be acquired for transfer to military uses by the Army. Existing uses managed by the SLC and other state agencies with jurisdiction over these lands will be transferred to the Army. No significant impacts are expected.

Private Lands

Private lands make up less than 2 percent of the lands within the Modified Avawatz-Silurian Alternative and are scattered throughout the Silurian Valley. Under this alternative, 4,380 acres of private land will be acquired for transfer to U.S. Army use and management. No significant impacts are expected.

Residential Uses

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

Agriculture

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

Uses by Religious Organizations

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

Adjacent Uses

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

Environmental Justice

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

4.10.2.2 Mitigation

Mitigation measures listed for the Proposed Action (Section 4.10.1.2) will apply to the Modified Avawatz-Silurian Alternative.

4.10.3 Modified Coyote Basin Alternative

4.10.3.1 Impacts

Federal/Public Lands

Implementation of the Modified Coyote Basin Alternative will result in the acquisition of 57,811 acres of private lands and 4,745 acres of state land, and the withdrawal of 196,914 acres of public lands for management and use by the military. Military management and use of federal lands of the CDCA will increase from 3.6 to 3.85 million acres.

Wilderness Study Area Interim Management

Approval and implementation of this alternative would remove approximately 87,890 acres of public lands in three legislatively designated WSAs. These include the Avawatz Mountains, South Avawatz Mountains, and Soda Mountains WSAs. Current administration of the affected area under the BLM Interim Management Policy to maintain the area's suitability for preservation as wilderness would cease. The inconsistency of this alternative with the current Wilderness Area Interim Management Policy and guidelines is defined as a significant impact.

Western Mojave Land Tenure Adjustment

Under this alternative, the WMLTA Project area will be reduced in scope by 50,560 acres of private land. This reduction in the amount of land suitable for transfer will not meet WMLTA Project objectives fully for the portion of the WMLTA Project within this alternative. This will result in a significant impact.

Multiple-Use Classifications, ACECs, and UPAs

Current BLM multiple-use classifications will no longer apply because the lands will be under management of the U.S. Army. Impacts on existing land uses will be similar to those discussed for the Proposed Action. The use of Silurian Lake for commercial filming will not be impacted. The public lands acquired for military operations under this alternative will include lands designated as the crucifixion thorn assemblage UPA near the Cronese Mountains. Military operations will conflict with existing BLM management plans for the unique biological resource present in this area, resulting in a potential significant impact.

Livestock Grazing

This alternative will adversely affect the Superior Valley, Cronese Lake, and Goldstone allotments. The cancellation of these grazing leases will be a significant adverse impact on the leaseholders; however, no significant regional economic impacts are expected.

Bidart Brothers, who hold the grazing privileges on the Superior Valley allotment, will lose 965 AUMs on 51,840 acres of public land. They will also lose the use of intermingled private and state land currently under lease. Martin Larralde, who holds the grazing privileges on the Goldstone allotment, will lose 572 AUMs on 9,006 acres of public land. He will also lose the use of intermingled private and state land currently under lease. These allotments were last grazed in 1988 and the 1991 BLM Grazing Decision eliminated grazing on these allotments. This alternative will eliminate the entire allotment area from livestock grazing.

There are no other available grazing areas within the region; therefore, transfer of grazing rights to other public lands is not a viable mitigation measure. For the sheep allotments (Superior Valley and Goldstone), the leaseholders will need to locate other critical spring forage somewhere between Bakersfield and their summer range (located out of state). There are no other allotments available for this transfer of use on public lands within the region. It is likely that no other ephemeral allotments are available on public lands within the entire southern California area.

Implementation of the Modified Coyote Basin Alternative will result in the loss of 1,205 AUMs on approximately 36,900 acres of the Cronese Lake allotment. Impacts on the Cronese Lake allotment under this alternative will be similar to impacts discussed for the Proposed Action.

State Lands

Under the Modified Coyote Basin Alternative, 4,745 acres of state land will be acquired for transfer to military uses by the Army. Existing uses managed by the SLC and other state agencies with jurisdiction over these lands will be transferred to the Army. No significant impacts are expected.

Private Lands

This alternative will result in the acquisition and transfer of 57,811 acres of private lands. Management of these lands will be transferred to the Army. No impacts are expected.

The acquisition of lands within the study area may inhibit the development of private lands at Harvard and Newberry Springs and may result in indirect adverse impacts on the cultural development and economic viability of these local communities and the county. However, as discussed previously, land use incompatibility with nearby military operations and the rural conservation zone designation constrains substantial growth throughout the study area. Based on these factors, no significant impacts on the development of private land in the vicinity of the acquisition area are expected.

Residential Uses

The Modified Coyote Basin Alternative includes approximately 30 improved residential parcels. Impacts on individual landowners will be the same as the Proposed Action. No significant impacts on regional housing supply or on opportunities to have isolated residential parcels within 50 miles of Barstow are expected.

Agriculture

The Modified Coyote Basin Alternative includes 320 acres of agricultural land located southeast of Coyote Lake. The Army will compensate for the fair market

value of the 320 acres of land. Impacts on agricultural lands under this alternative are not considered significant because of the lack of prime or unique farmlands or farmlands of statewide or local importance. The farm owner will experience a short-term impact.

Uses by Religious Organizations

The monastery and its associated 20 acres are located in the expansion area of this alternative and will be removed. Compensation for the appraised value of the improved property and moving costs will also be provided by the Army as required by Public Law 91-646 and per existing Army policies regarding acquisition of lease properties. Based on a field visit, it appears that the monastery structures have been built since the last county property assessment in 1987.

An additional mitigation measure, if applied, that could further reduce the level of impact is the exclusion of the area immediately around the monastery (i.e., approximately 1 square mile). However, this mitigation measure was not considered feasible because of the constraints that will be imposed on NTC field maneuvers. Exclusion of the area associated with the monastery will preclude regimented use of the area south of Coyote Lake. Furthermore, the potential risks of machinery traversing the lakebed will increase. Without an exclusionary area around the monastery, potential impacts will include increased noise and dust levels that will be produced by nearby NTC operations. These factors will interfere with the remote and serene characteristics of the monastery.

Adjacent Uses

The Modified Coyote Basin Alternative will have similar impacts on those for the Proposed Action discussed in Section 4.10.1.1. Additional incidents of trespassing onto lands outside the NTC could occur. Without significant topographic features for visual identification of NTC boundaries near the Rainbow Basin/Superior Lake area, it is anticipated that these areas will be prone to incidental trespass. No significant impacts are expected.

Environmental Justice

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

4.10.3.2 Mitigation

Mitigation measures listed for the Proposed Action (Section 4.10.1.2) will apply to the Modified Coyote Basin Alternative.

4.10.4 Alvord Alternative

4.10.4.1 Impacts

Federal/Public Lands

The Alvord Alternative will result in the acquisition of 37,300 acres of private land and 4,800 acres of state land, and withdrawal of 168,700 acres of public lands for management and use by the military. This will increase military management and use of federal lands of the CDCA from 3.6 to 3.8 million acres. Resource protection and multiple uses currently managed by the BLM will no longer apply to these acres.

Wilderness Study Area Interim Management

Approval and implementation of this alternative would remove approximately 87,980 acres of public lands in three legislatively designated WSAs. These include the Avawatz Mountains, South Avawatz Mountains, and Soda Mountains WSAs. Current administration of the affected area under the BLM Interim Management Policy to maintain the area's suitability for preservation as wilderness would cease. The inconsistency of this alternative with the current Wilderness Area Interim Management Policy and guidelines is defined as a significant impact.

Western Mojave Land Tenure Adjustment

The WMLTA Project will be reduced in scope by 35,840 acres. Impacts will be similar to impacts discussed for the Modified Coyote Basin Alternative.

Multiple-Use Classifications, ACECs, and UPAs

Current BLM multiple-use classifications will no longer apply because the lands will be under management of the U.S. Army. Impacts on existing land uses will be similar to those discussed for the Proposed Action. The use of Silurian Lake for commercial filming will not be impacted. The public lands acquired for military operations in this alternative

will include lands designated as the crucifixion thorn UPA near the Cronese Mountains. Impacts from military operations in this area will be similar to impacts discussed for the Modified Coyote Basin Alternative.

Livestock Grazing

This alternative will adversely affect the Superior Valley, Cronese Lake, and Goldstone allotments. The cancellation of these grazing leases is regarded as a significant, unavoidable impact on the leaseholders. Impacts on the Superior Valley allotment leaseholder will be less than with the Modified Coyote Basin Alternative. Impacts on Cronese Lake and Goldstone allotment leaseholders will be similar to impacts discussed for the Modified Coyote Basin Alternative (Table 4.10-2).

State Lands

Under the Alvord Alternative, 4,800 acres of state land will be acquired for transfer to military uses by the Army. Existing uses managed by the SLC and other state agencies with jurisdiction over these lands will be transferred to the Army. No significant impacts are expected.

Private Lands

The Alvord Alternative will result in the acquisition and transfer of 37,300 acres of private lands located in the southern portion of this alternative expansion area. These lands will be transferred over for Army use and management. No significant impacts are expected.

Residential Uses

This alternative includes 10 improved residential parcels as determined through the county plats. Impacts on the individual landowners and regional housing supply will be similar to those discussed for the Proposed Action.

Agriculture

The Alvord Alternative does not include any agricultural land within the expansion area. No impacts on agricultural uses are expected.

Uses by Religious Organizations

This alternative does not include the monastery within the expansion area. While monastery lands will not be acquired by the Army, adjacent NTC maneuvers, including thousands of soldiers and vehicles, will potentially pass within 2 miles of the monastery. The associated noise and dust may be incompatible with monastic activities, resulting in a potential significant impact. No provision will be made to purchase the monastery because it does not lie within the expanded boundaries of the NTC.

Adjacent Uses

The Alvord Alternative will have similar impacts on adjacent land uses as discussed for the Modified Coyote Basin Alternative.

4.10.4.2 Mitigation

Mitigation measures listed for the Proposed Action (Section 4.10.1.2) will apply to the Alvord Alternative.

4.10.5 Superior Valley Alternative

4.10.5.1 Impacts

Federal/Public Lands

This alternative will result in the acquisition of 79,300 acres of private land and 3,331 acres of state land, and withdrawal of 202,254 acres of public lands for management and use by the Army. This will increase military management and use of federal lands of the CDCA from 3.6 to 3.8 million acres. Resource protection and multiple uses currently managed by BLM will no longer apply to these acres.

Wilderness Study Area Interim Management

Two WSAs will be affected by implementation of this alternative. These include approximately 23,250 acres of the South Avawatz Mountains WSA and approximately 11,520 acres of the Avawatz Mountains WSA. The inconsistency of this alternative with the current Wilderness Area Interim Management Policy and Guidelines is defined as a significant impact.

Western Mojave Land Tenure Adjustment

The WMLTA Project will be reduced in scope by 151,680 acres.

Multiple-Use Classifications, ACECs, and UPAs

Current BLM multiple-use classifications will no longer apply because the lands will be under management of the U.S. Army. Impacts on existing land uses will be similar to those discussed for the Proposed Action. No ACECs or UPAs will be affected. Commercial filming at Silurian Lake would not be impacted but filming at Superior Dry Lake would no longer be possible.

Livestock Grazing

The Superior Valley Alternative will adversely affect the Superior Valley, Cronese Lake, and Goldstone allotments. The cancellation of these grazing areas is regarded as a significant impact on the leaseholders. Reductions in allotment acreage and livestock forage are substantially greater for the Superior Valley allotment, but less than the Silurian Valley (Proposed Action), Modified Coyote Basin, and Alvord Alternatives for the Cronese Lake allotment.

State Lands

Under the Alvord Alternative, 3,331 acres of state land will be acquired for transfer to military uses by the Army. Existing uses managed by the SLC and other state agencies with jurisdiction over these lands will be transferred to the Army. No significant impacts are expected.

Private Lands

This alternative will result in the acquisition and transfer of 79,300 acres of private lands located in the southern portion of this alternative expansion area. These lands will be transferred over for Army use and management. No significant impacts are expected.

Residential Uses

This alternative includes 30 improved residential parcels as determined by county plats. Impacts on the individual landowners and the regional housing supply will be similar to those discussed for the Proposed Action.

Agriculture

This alternative includes the 320 acres of agricultural land located in the southern portion of the alternative expansion area. No prime or unique farmlands or farmlands of statewide or local importance are located in the expansion area. Impacts will be similar to those discussed for the Modified Coyote Basin Alternative.

Uses by Religious Organizations

This alternative includes the monastery and its associated 20 acres that will be removed as a result of this alternative. Impacts are the similar to those discussed for the Modified Coyote Basin Alternative.

Adjacent Uses

The Superior Valley Alternative will have similar impacts on the Modified Coyote Basin Alternative relative to the potential for incidental trespass.

Environmental Justice

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

4.10.5.2 Mitigation

Mitigation measures listed for the Proposed Action (Section 4.10.1.2) will apply to the Superior Valley Alternative.

4.10.6 Avawatz Alternative

4.10.6.1 Impacts

Federal/Public Land

This alternative will result in the acquisition of 45,900 acres of private land and 2,000 acres of state land, and withdrawal of 137,600 acres of public lands for management by and use of the Army. This will increase the amount of federal lands managed and used by the military within the CDCA from 3.6 to 3.8 million acres.

Wilderness Study Area Interim Management

The impacts on WSAs will be the same as those discussed under the Superior Valley Alternative (Section 4.10.5.1).

Western Mojave Land Tenure Adjustment

The WMLTA Project will be reduced in scope by 51,840 acres. Resource protection and multiple uses managed by the BLM will not apply for these acres. Impacts will be similar to those discussed for the Modified Coyote Basin Alternative (Section 4.10.3.1).

Multiple-Use Classifications, ACECs, and UPAs

Current BLM multiple-use classifications will no longer apply because the lands will be under management of the U.S. Army. Impacts on existing land uses will be similar to those discussed for the Proposed Action. The use of Silurian Lake for commercial filming would not be impacted. No ACECs or UPAs will be affected.

Livestock Grazing

This alternative will adversely affect the Superior Valley, Cronese Lake, and Goldstone allotments. The cancellation of these grazing leases is regarded as a significant adverse impact on the leaseholders. Loss of allotment acreage and AUMs for this alternative will be the same as that discussed under the Superior Valley Alternative for the Cronese Lake and Goldstone allotments. There will be a loss of 28,000 acres of allotment and 386 AUMs for the Superior Valley allotment.

State Lands

Under the Avawatz Alternative, 2,000 acres of state land will be acquired for transfer to military uses by the Army. Existing uses managed by the SLC and other state agencies with jurisdiction over these lands will be transferred to the Army. No significant impacts are expected.

Private Lands

This alternative will result in the acquisition and transfer of 45,900 acres of private lands located in the southern portion of this alternative expansion area. Management and use of these lands will be transferred to the Army.

Residential Uses

The expansion area of the Avawatz Alternative includes approximately 27 improved residential parcels. Impacts on individual land owners will be the same as the Proposed Action. No significant impacts on regional housing supply or on opportunities to have isolated residential parcels within 50 miles of Barstow are expected.

Agriculture

This alternative will also include the 320 acres of agricultural land located in the southern portion of the alternative expansion area. No prime or unique farmlands or farmlands of statewide or local importance are located in the expansion area. Impacts will be similar to those discussed for the Modified Coyote Basin Alternative.

Uses by Religious Organizations

The monastery and its associated 20 acres will be removed as a result of this alternative. Impacts are similar to those discussed for the Modified Coyote Basin Alternative.

Adjacent Uses

The Avawatz Alternative will have similar impacts as the Modified Coyote Basin Alternative relative to the potential for incidental trespass in the southwestern portion of the study area.

Environmental Justice

Impacts will be similar to those discussed for the Proposed Action (Section 4.10.1.1).

4.10.6.2 Mitigation

Mitigation measures listed for the Proposed Action (Section 4.10.1.2) will apply to the Avawatz Alternative.

4.10.7 No Action Alternative

4.10.7.1 Impacts

Federal/Public Lands

Under the No Action Alternative, no withdrawal of additional public lands or acquisition of private land will occur. U.S. Army training will continue within the existing NTC boundaries. Management of public lands will continue under the authority of the BLM and the policies of the CDCA Plan. No inconsistency with existing policies regulating BLM-administered lands is anticipated; therefore, no significant impacts are expected.

Wilderness Study Area Interim Management

Five legislatively designated WSAs would continue in their current status until a Congressional decision is made to designate them as wilderness or release the areas from further review.

Western Mojave Land Tenure Adjustment

In addition, under the recent 1991 Record of Decision and Plan Amendment for the WMLTA Project, state and private land within the expansion study area will be subject to acquisition by the BLM under a voluntary exchange program. Implementation of the WMLTA Project will result in an WMLTA Project-wide acquisition of up to 250,000 acres of private land to meet project objectives within the Barstow Resource Area. Under the No Action Alternative, 40,000 acres of state and private lands within the study area will be acquired and managed by the BLM. Public lands closer to existing communities and developments will be available to exchange for private lands under a voluntary transfer program. This alternative will meet WMLTA Project objectives fully for the portion of the WMLTA Project within the expansion project area (MBA 1991). No significant impacts are expected.

Multiple-Use Classifications, ACECs, and UPAs

BLM-administered lands under Multiple-Use Classifications and within ACEC and UPA designations will remain under the current management and protection policies of the CDCA. No withdrawal of these public lands from BLM administration will occur under the No Action Alternative. No significant impacts will occur.

The net effect of the No Action Alternative will be a substantial improvement in the ability of the BLM to manage existing public lands. Resource protection and multiple-use management will be enhanced, and high-density residential development will be prevented on these acquired lands, resulting in a beneficial impact on natural resources.

Livestock Grazing

With the No Action Alternative, one grazing allotment will continue current operation. Foreseeable modifications to current operations will occur with revision of the AMP for the Cronese Lake allotment. AMP implementation will include water development and fencing to improve livestock distribution patterns. Other actions that will affect livestock grazing under the continued management of the BLM will be development of an HMP for the desert tortoise in the western Mojave Desert. This HMP will consider the impacts of livestock grazing throughout the western Mojave Desert and will make recommendations

regarding whether livestock use should continue under current management or be removed from tortoise habitat. Any decision to change authorized land use patterns, including grazing, in the CDCA will be provided through the CDCA Plan amendment process with associated NEPA compliance and public participation opportunities.

Some private land is currently leased for grazing, but other privately owned parcels are subject to development and associated access restrictions to rangewide livestock use. The WMLTA Project seeks to acquire about 40,000 acres of private land within the Superior Valley and Goldstone allotments. No increase in net grazing allocation will occur as a result of WMLTA implementation, but grazing management will be more readily applied to the entire allotment. No significant impacts are expected.

State Lands

State lands will remain under existing management by the SLC and other appropriate state agencies. No significant impacts are expected.

Private Lands

According to the Quarterly Economic Report (San Bernardino County Central Credit Union 1988), San Bernardino experienced a growth in population of 15 percent between 1985 and 1988. In the vicinity of the study area, only Adelanto and Victorville exceed the county average with growth rates of 45.7 and 30.6 percent, respectively, for the same period. Barstow, the nearest community to the study area, had a growth rate of 7 percent, which is considered well below the county average. Growth rates were not available for Apple Valley or Baker. With existing growth rates, there does not appear to be an immediate demand to develop private lands within the study area. Because of the lack of services within the study area (RCN DL-40 designation) and the land use incompatibility with the nearby China Lake NAWS to the northwest and Fort Irwin NTC to the north, private land developments within the study area will be limited. There are no current proposals for private land development of over one dwelling unit per 40 acres within the study area. Because of the lack of infrastructure and services, the future of the area is not likely to include private land development of over one dwelling unit per 40 acres.

Information regarding the use of private lands was compiled by the Corps' Los Angeles District, Real Estate Division, and was analyzed to relate the location and distribution of residential property to each proposed alternative. The total land area of each alternative ranges from approximately 186,000 to 330,000 acres. Private lands affected within each of the alternatives range from 8,038 to 79,000 acres and represent from 2 to 28 percent of their respective totals. Much of this land is vacant, with land owners holding property rights to a particular parcel. Under the No Action Alternative, these lands will remain under private ownership. Current county land use designations and zoning will also remain. No significant impacts are expected.

Mining

Under the No Action Alternative, current mining activities on private parcels will remain. Impacts on mining uses for the Proposed Action and each alternative are further discussed in Section 4.12, Mining.

Residential Uses

Improved residential property within the study area includes private land with a residential unit built on it. Use of these properties will continue, as will free access by the network of paved and dirt roads throughout the study area. Existing private ownership will continue with restrictions on residency established by county zoning and land use designations. No significant impacts are expected.

Agriculture

There are occasional crops planted on private lands within the study area (Figure 3.10-5) depending on specific environmental and market variables (e.g., water availability, county moratorium). Agricultural use within the study area is of low intensity and of no local or statewide importance. One land owner was reported to be using a portion of the study area for crop production; however, the land had not been used for crop production in 1988 (SCS 1988). This area includes 320 acres of land (according to county plats) and is located northwest of the power lines and the community of Harvard, near the southern boundary of the study area.

Uses by Religious Organizations

The Coptic Orthodox monastery and the associated 20 acres of land will remain at the existing location. It is unknown whether the recently constructed buildings are considered consecrated. In addition, it is not known to what extent the monastery is dependent on isolation and a relatively undisturbed natural setting. Under the No Action Alternative, no significant adverse impacts relative to existing land uses on this site are expected.

Adjacent Land Uses

Under the No Action Alternative, existing adjacent land uses are expected to remain. The lands in the surrounding region that are part of the CDCA will continue to be administered by the BLM. National Forest lands to the north will continue to be administered by the policies of the National Park Service. Private lands to the south and within the vicinity of the Silurian Valley will retain their current land use and zoning designations as determined by San Bernardino County. Under this alternative, no conflicts with existing land use policies and designations are expected. No significant impacts will occur.

Environmental Justice

Existing private ownership will continue with restrictions on residences established by county zoning and land use designations. No significant impacts are expected.

4.10.7.2 Mitigation

No significant impacts are expected; therefore, no mitigation measures are required.

4.10.8 Cumulative Impacts

Portions of all of the cumulative projects involve the use of BLM lands as well as private lands. The Proposed Action will result in the withdrawal of 310,296 acres of public lands from direct BLM management. The Ward Valley Project will transfer about 1,000 acres of federal land managed by the BLM to the State of California. The MCGCC Vehicle Corridor project would not reduce land acreage under BLM management, but the approximately 900 acres of land involved would be converted from desert habitat to highly impacted land use. The Hidden Valley Resources Project would disturb approximately 260 acres of public land and 1,220 acres of private land over the life of the project. The Broadwell Basin project would require access through public lands and disturbance of approximately 640 acres of private lands. The Rail Cycle project involves approximately 1,280 acres of public lands and 3,200 acres of private lands. The Hector Mine and Fort Cady Projects would take place on leasable mineral lands. The BLM makes lands available for the development of federal mineral resources, consistent with Section 2 of the Mining and Mineral Policy Act of 1970, and Section 102(a)(7),(8) and (12) of the FLPMA. The BLM requires proper reclamation of these projects.

The cumulative impacts from these projects will involve the loss of grazing privileges on three ephemeral/perennial grazing allotments. The Proposed Action will result in the loss of 812 AUMs on 29,200 acres of the 55,000 acres of the Cronese Lake allotment. The Hidden Valley Ranch and MCGCC Vehicle Corridor Projects will impact 47 AUMs on 455 acres of the 118,000-acre Cady Mountains allotment. The Ward Valley LLRW Project would involve the loss of less than 10 AUMs on 1,280 acres on the 452,000-acre Lazy Daisy allotment. Mitigation measures listed in Section 4.10.1.2 will reduce the Proposed Action's contribution to cumulative land use impacts. However, no mitigation is available that will reduce the impact of the loss of grazing leases to less than significant.

4.10.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.10-3. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.10-4.

Table 4.10-3

LAND USE - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Acquisition of 310,296 acres public lands, 5,148 acres private lands, and 15,773 acres state lands for military use.	Acquisition of 253,300 acres public lands, 4,380 acres private lands, and 12,350 acres state lands for military use.	Acquisition of 196,914 acres public lands, 57,811 acres private lands, and 4,745 acres state lands for military use.	Acquisition of 168,700 acres public lands, 37,300 acres private lands, and 4,800 acres state lands for military use.	Acquisition of 202,254 acres public lands, 79,300 acres private lands, and 3,331 acres state lands for military use.	Acquisition of 137,600 acres public lands, 45,900 acres private lands, and 2,000 acres state lands for military use.	No change.
Military operations inconsistent with existing BLM multiple-use areas and Salt Creek Hills and Denning Springs ACECs, resulting in a significant impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in a significant impact.	Military operations inconsistent with existing BLM multiple-use areas and crucifixion thorn UPA, resulting in a significant impact.	Military operations inconsistent with existing BLM multiple-use areas and crucifixion thorn UPA, resulting in a significant impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in a significant impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in a significant impact.	No change in current BLM multiple use mangement.
Significant impact from loss of 29,200 grazing acres.	Less than significant impact from loss of 490 grazing acres.	Significant impact from loss of 97,746 grazing acres and reduction of 50,560 acres of private land in the Western Mojave Land Tenure area.	Significant impact from loss of 69,586 grazing acres and reduction of 35,840 acres of private land in the Western Mojave Land Tenure area.	Significant impact from loss of 118,106 grazing acres and reduction of 151,680 acres of private land in the Western Mojave Land Tenure area.	Significant impact from loss of 41,606 grazing acres and reduction of 51,840 acres of private land in the Western Mojave Land Tenure area.	No change in current BLM multiple use mangement.

Table 4.10-4

LAND USE - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Impacts on existing BLM multiple-use areas and ACECs remain significant.	Impacts on existing BLM multiple-use areas remain significant.	Impacts on existing BLM multiple-use areas and UPA remain significant.	Impacts on existing BLM multiple-use areas and UPA remain significant.	Impacts on existing BLM multiple-use areas remain significant.	Impacts on existing BLM multiple-use areas remain significant.
Loss of 29,200 grazing acres remains significant.	Loss of 490 grazing acres remains less than significant.	Loss of 97,746 grazing acres and reduction of 50,560 acres of private land in the Western Mojave Land Tenure area remains significant.	Loss of 69,586 grazing acres and reduction of 35,840 acres of private land in the Western Mojave Land Tenure area remains significant.	Loss of 118,106 grazing acres and reduction of 151,680 acres of private land in the Western Mojave Land Tenure area remains significant.	Loss of 41,606 grazing acres and reduction of 51,840 acres of private land in the Western Mojave Land Tenure area remains significant.

4.11 RECREATION

The proposed acquisition of additional lands by NTC could have variable impacts on organized and dispersed recreational uses in relation to the specific alternative that may be implemented. The following addresses each recreation use, how it may be adversely affected by each alternative, and what the associated environmental consequences may be. Mitigation measures required to avoid or minimize impacts on existing recreation uses are recommended.

Significance Criteria

Land Sailing

A significant impact on land sailing was defined as the loss of opportunity to use Superior Dry Lake 1 for land sailing and organized events. This area is the only remaining high-quality opportunity for land sailing in the CDCA.

Rock Hounding

A significant impact on this recreation resource was defined as the loss of opportunity to rock hound Old Miocene deposits within a half-day drive from the Los Angeles Basin.

Sightseeing and Camping

A significant impact on this type of recreation was defined as the loss of opportunity to have a dispersed camping experience or a substantial decline in the quality of the camping experience within a half-day drive from the Los Angeles Basin.

Dispersed Off-Highway Vehicle Use

A significant impact on this type of recreation was defined as the loss of the opportunity for dispersed and nonintensive OHV use within a half-day drive from the Los Angeles Basin.

Horseback Riding

A significant impact on this type of recreation was defined as the loss of the opportunity for horseback riding within a half-day drive from the Los Angeles Basin.

Hunting and Shooting

A significant impact was defined as the loss of opportunity to target shoot or hunt any existing game species within a half-day drive from the Los Angeles Basin.

4.11.1 Proposed Action

4.11.1.1 Impacts

Land Sailing

This alternative does not include Superior Dry Lake 1 or Ivanpah Dry Lake (which is outside the study area). No significant adverse impacts on land sailing are associated with this alternative. A loss of opportunity to use Silurian Dry Lake will result in an impact on recreational opportunities. However, because the lake does not possess high-quality land sailing opportunities and is not highly used for this activity (fewer than 50 visitor use days [VUDs] annually), this impact is not considered significant.

Dispersed Recreation

As a group, dispersed recreationists have used public lands in the study area without the constraints of a limited period of use or a permit system. It is likely that these users will not use the expansion area under the requirements of a military permit system. Displacement of these users to other comparable recreation areas in the western Mojave Desert region will shift a portion of recreation-generated revenues to other desert communities. For example, if users did not travel through Barstow as they entered the desert but instead traveled along State Highway 395 through Victorville and Kramer Junction, they would buy food and supplies in these communities instead of in Barstow. Not all users will avoid Barstow; probably at least one-half will continue to focus on desert areas accessed via Barstow. However, for uses that are displaced farther, the shift in revenue may have an adverse effect on local desert communities. This loss will include revenues generated from future growth of recreational activities anticipated within the region.

The most likely areas in which dispersed recreational use will be displaced will include Opal Mountain, Murphy's Well, Black Canyon, and Fremont Peak areas. Intensively used or developed areas, such as Stoddard and Johnson Valley OHV Open Areas and Owl Canyon and Afton Canyon campgrounds, may be destination areas. However, most dispersed recreation enthusiasts prefer less crowded environs than these and will likely be displaced to Fremont Peak and other similar areas. This displacement is currently occurring from actions taken at other previously unstructured recreation areas such as Afton Canyon and Rand Mountain/Fremont Valley; much of this use is being displaced to the Fremont Peak/Cuddeback Lake area. This is resulting in a decline in the quality of the dispersed recreational experience Fremont Peak as it becomes more crowded. Increased recreational use also includes related impacts on natural resources. Should substantial impacts occur to desert tortoises or their habitat near Fremont Peak, recreational use here may also become more constrained or possibly even eliminated.

Rock Hounding

Access to Old Miocene deposits in the eastern foothills of the Avawatz Mountains will be restricted by military training activities. This will result in a displacement of use to other regional Old Miocene deposits. Not all users will be displaced; some will continue to use the area on a scheduled basis. Exact figures for visitor use days (VUDs) are unknown within the study area, although current vehicle-dependent recreation use levels are considered low for this area (BLM 1990). It is probable that at least 300 VUDs will be displaced with selection of this alternative. Other Old Miocene deposits that will continue to be available and used by rock hounders under this alternative include Lane Mountain, Afton Canyon, Rainbow Basin, and Devil's Playground. Recreational expenditures resulting from rockhounding in the Avawatz Mountains probably occur in Baker. Displacement may result in an increase of recreational expenditures in the Barstow area because most of these other areas are accessed via the Barstow area. Only a portion of the use displacement (to Devil's Playground) will result in recreation expenditures remaining in Baker. Rocks and minerals sought by rock hounders will be available elsewhere in the Barstow vicinity and nearby. Because limited access will still be available to the eastern foothills of the Avawatz Mountains and current use levels are low, impacts on rock hounding are considered less than significant.

Sightseeing and Camping

This alternative will restrict public use of 310,296 acres of public lands now open to unrestricted sightseeing and camping opportunities . The number of visitors camping and sightseeing in the study area is unknown. It is probable that 500 to 1,000 VUDs will be displaced with selection of this alternative. Because most users of these public lands will continue to desire an unconstrained and dispersed camping/sightseeing experience, it is likely that some use will shift to Paradise Range, Spanish Canyon, Rainbow Basin/Owl Canyon, the Calico Mountains, Fremont Peak, Opal Mountain, Black Canyon, Inscription Canyon, and Superior Valley areas. Because camping will still be available in these other areas, impacts on camping and sightseeing are considered less than significant.

Dispersed OHV Use

This alternative includes 35 miles of the power line maintenance road within the corridor, which has been identified as an OHV use, and several California Stateside Motorized Trails cross the Silurian Valley. Additionally, the Salt Creek Hills ACEC is located in the northern portion of the Proposed Action. Public use of these areas within this alternative will be restricted. Although the exact figure for VUDs is not known, it is probable that at least 2,000 VUDs will be displaced with selection of this alternative.

Individuals desiring continued use of designated routes within moderate and limited use multiple-use classes will be displaced to areas near Fremont Peak, Black Canyon, Opal Mountain, and Superior Valley. Individuals desiring a more intensive experience will be displaced to OHV open areas at Johnson Valley, Stoddard Valley, and Rasor. Limitations to the dispersed OHV use area will result in less than significant impacts.

Horseback Riding

Horseback riding within the study area is currently concentrated in the Paradise Valley, Lane Mountain, and Spanish Canyon areas. These areas will not be impacted by this alternative.

Hunting and Shooting

Hunting and shooting events within the study area are infrequent and well dispersed. However, the Calico Mountains have been identified as an optimum area for hunting because of the presence of suitable densities of game species. These areas will not be impacted by this alternative.

4.11.1.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of NTC funding:

1. A public access policy will be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area as is presently done on the existing NTC. Access will also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, off-road vehicles, etc.

4.11.2 Modified Avawatz-Silurian Alternative

4.11.2.1 Impacts

Land Sailing

Impacts will be similar to those discussed for the Proposed Action.

Dispersed Recreation

Impacts will be similar to those discussed for the Proposed Action.

Rock Hounding

Impacts will be similar to those discussed for the Proposed Action.

Sightseeing and Camping

Impacts will be similar to those discussed for the Proposed Action. The Salt Creek Hills ACEC will not be impacted by this alternative.

Dispersed OHV Use

This alternative will cross the power line maintenance road within the corridor at two points involving 5.5 miles. This road, which has been identified as an OHV use, and several California stateside motorized trails cross the Silurian Valley. Because only 5.5 miles of the maintenance road will be restricted from public use, impacts on dispersed OHV use will not be significant.

Horseback Riding

Horseback riding within the study area is currently concentrated in the Paradise Valley, Lane Mountain, and Spanish Canyon areas. These areas will not be impacted by this alternative.

Hunting and Shooting

Hunting and shooting events within the study area are infrequent and well dispersed. However, the Calico Mountains have been identified as an optimum area for hunting because of the presence of suitable densities of game species. These areas will not be impacted by this alternative.

4.11.2.2 Mitigation

Mitigation Measure listed for the Proposed Action (Section 4.11.1.2) will apply to the Modified Avawatz-Silurian Alternative.

4.11.3 Modified Coyote Basin Alternative

4.11.3.1 Impacts

Land Sailing

The Modified Coyote Basin Alternative does not include the Superior Lake 1, so there will be no impacts to recreational land sailing.

Rock Hounding

The configuration of the Modified Coyote Basin Alternative will avoid the rock hounding areas around Lane Mountain. Dispersed recreation, such as rock hounding, could still occur on the western slope of Lane Mountain. However, impacts will occur because rock hounding will be prohibited at Avawatz Mountains, Alvord Mountain, and Spanish Canyon. As noted previously, these are especially popular areas for rock hounding. Although the exact figure for VUDs is not known, it is probable that at least 1,000 VUDs will be displaced with selection of this alternative. Other Old Miocene deposits that will continue to be available and used by rock hounders under this alternative include Afton Canyon, Rainbow Basin, and Devil's Playground. Because these other areas would still be available, impacts on rock hounding are considered less than significant.

Sightseeing and Camping

Use of approximately 196,914 acres of public lands in the Modified Coyote Basin Alternative will be prohibited. Sightseeing and camping areas that will be affected include Spanish Canyon and Paradise Springs. While the exact figure for VUDs spent within the area of this alternative is unknown, it is probable that 750 to 1,500 VUDs will be displaced to other areas. Camping and sightseeing in the Superior Valley and Superior Lakes will not be affected by this alternative. With restricted use of Spanish Canyon and Paradise Springs, it is anticipated that some use will be displaced to other camping and sightseeing areas, such as Opal Mountain/Black Canyon, Fremont Peak, Inscription Canyon, and Superior Valley areas. Because camping would still be available in these other areas, impacts on camping and sightseeing are considered less than significant.

Dispersed OHV Use

Approximately 136 miles of trails, including 35.5 miles of power line maintenance road, will have restricted public OHV use. While the exact figure for VUDs spent within the area of this alternative is unknown, it is probable that 2,000 VUDs will be displaced to other areas. Displaced use will probably be transferred to areas such as Fremont Peak, Black Canyon, Opal Mountain, and portions of Superior Valley. As with the other alternatives, the Modified Coyote Basin Alternative will, in conjunction with other land use restrictions in the western Mojave Desert region, cause a reduction in the quality of recreational experiences available in the region. Implementation of this alternative will have a less than significant impact on OHV use.

Horseback Riding

Implementation of the Modified Coyote Basin Alternative will prohibit horseback riding destination points within the study area. This alternative will restrict access to a portion of the Superior Valley. It is anticipated that displaced users will use the Calico Mountains and Afton Canyon for horseback riding instead of the expansion area. While the exact figure for VUDs spent within the area of this alternative is unknown, it is probable that 1,000 VUDs will be displaced to other areas. Of these 1,000, at least 75 percent (or 750 VUDs) will be displaced to other areas. Because sufficient riding opportunities are readily available near Barstow, this action will not cause significant impacts.

Hunting and Shooting

Hunting and shooting events within the study area are infrequent and well dispersed. However, the Calico Mountains have been identified as an optimum area for hunting because of the presence of suitable densities of game species. Because of the low-intensity nature of recreational hunting and shooting, the loss of this activity in this area will not be significant on a regional basis. While the exact number of VUDS for hunting and shooting is not known, it is probable that 1,250 VUDs will be displaced to other areas with implementation of this alternative. Hunting in the Calico Mountains will not be impacted with implementation of this alternative. Displacement of hunting and shooting activities to Superior Valley, South Avawatz, and areas farther west is considered to be a less than significant impact.

4.11.3.2 Mitigation

Mitigation Measures listed for the Proposed Action (Section 4.11.1.2) will apply to the Modified Coyote Basin Alternative.

4.11.4 Alvord Alternative

4.11.4.1 Impacts

Land Sailing

This alternative does not include Superior Dry Lake 1. No adverse impacts on land sailing are associated with this alternative.

Rock Hounding

The impacts on rock hounding are expected to be similar to those mentioned for the Modified Coyote Basin Alternative (Section 4.11.3.1).

Sightseeing and Camping

This alternative would prohibit use of 168,700 acres of public lands. The Paradise Springs area will not be affected by this alternative. It is likely that dispersed camping and sightseeing on public lands will shift to Fremont Peak, Opal Mountain, Black Canyon, and Inscription Canyon. While exact numbers of VUDs using the area within this alternative are unknown, it is probable that 500 to 1,000 VUDs will be displaced to other areas. Economic benefits associated with these uses will shift to some degree as well. However, because camping and sightseeing opportunities will still be available in the Barstow area (i.e., the Paradise Springs area), this impact is expected to be less than significant.

Dispersed OHV Use

This alternative will have impacts similar to those of the Modified Coyote Basin Alternative. Approximately 136 miles of roads, trails, and washes will be eliminated from OHV use in the area. Displacement of at least 2,000 VUDs to other dispersed recreation areas will cause a reduction in the quality of the dispersed OHV recreation experience in the western Mojave Desert region. Implementation of this alternative will have a less than significant impact on OHV use.

Horseback Riding

This alternative will preclude use of the same areas described for the Modified Coyote Basin Alternative. It is likely that displaced users will use the Calico Mountains, Afton Canyon, and Superior Valley. Because sufficient riding opportunities are readily available near Barstow, no significant impacts are expected.

Hunting and Shooting

While the exact number of VUDs for hunting and shooting is not known, it is probable that at least 1,250 VUDs will be displaced to other areas with implementation of this alternative. Displacement of hunting and shooting activities to Superior Valley, South Avawatz, and areas farther west is considered to be a less than significant impact.

4.11.4.2 Mitigation

The mitigation measures for this alternative will be the same as those described under the Proposed Action (Section 4.11.1.2).

4.11.5 Superior Valley Alternative

4.11.5.1 Impacts

Land Sailing

This alternative includes Superior Dry Lake 1, which has been identified as an area heavily used by the land sailing community. Access to Superior Dry Lake 1 will be incorporated into the expansion area to be managed for military uses. Existing access via the Copper City Mine Road will be eliminated during this period and subject to military vehicle traffic, which will tend to cause washboarding of the road surface. The loss of the lake surface for land sailing events and practice or play is a significant loss of the opportunity to experience land sailing and an associated economic loss to adjacent desert communities. In addition, there is a substantial increased risk for disturbance to the dry lake surface from operation of military equipment adjacent to the lake.

The residual impact on the use of Superior Dry Lake 1 for land sailing is significant because opportunities for use will be eliminated for more than half of the year. In addition, accidental military vehicle traffic on the lakebed surface may cause enough disturbance that the lakebed surface will no longer be suitable for land sailing. While exact VUD figures for the users of

Superior Dry Lake 1 are unknown, it is probable that 1,000 to 2,500 VUDs will be lost from this resource. Some use will transfer to Superior Dry Lake 3, but road access to that area is limited. Other use will be displaced to Ivanpah Dry Lake. Use displaced to Superior Dry Lake 3 will prevent an economic loss to local communities; however, displacement of use to Ivanpah Dry Lake will transfer expenditures of recreation money (from $17,000 to $37,500 per year) to other communities.

Rock Hounding

This alternative includes the same rockhounding areas addressed in the Modified Coyote Basin Alternative. In addition, this alternative incorporates the eastern and western portions of Lane Mountain. Additional VUDs will therefore also be affected by displacement of use to other areas. Although the exact figure for VUDs is not known, it is probable that 1,000 to 1,500 VUDs will be displaced with selection of this alternative. More of these VUDs will be displaced to areas away from Barstow because Lane Mountain will be entirely within the expansion area of the NTC. Other Old Miocene deposits that will continue to be available and used by rock hounders under this alternative include Avawatz Mountains, Afton Canyon, Rainbow Basin, and Devil's Playground. As these other areas would still be available, impacts on rock hounding are considered less than significant.

Sightseeing and Camping

This alternative would prohibit 202,254 acres of public land, the Paradise Springs and Spanish Canyon areas, and Superior Valley and Superior Lakes. It is likely that dispersed camping and sightseeing on public lands will shift to Fremont Peak, Opal Mountain, Black Canyon, and Inscription Canyon. While the exact figure for VUDs spent within the area of this alternative is unknown, it is probable that 1,500 to 3,000 VUDs will be displaced to these other areas.

Because camping would still be available in these other areas, impacts on camping and sightseeing are considered less than significant.

Dispersed OHV Use

This alternative will encumber the use of the Superior Valley area and essentially remove all dispersed OHV use (not associated with organized events) from this high use area. One hundred thirty-six miles of roads, trails, and washes will be affected. While the exact number of VUDs associated with OHVs use for this alternative area is not known, it is probable that at least 7,000 VUDs will be displaced. Displacement of OHV will cause a reduction in the quality of the dispersed OHV recreation experience in the western Mojave Desert region. Implementation of this alternative will have a less than significant impact on OHV use.

Horseback Riding

This alternative will restrict access to the northern end of the Mud Hills, Lane Mountain, Spanish Canyon, and Paradise Valley areas for 215 days or more per year. It is likely that displaced users will use the Calico Mountains and Afton Canyon. While the exact number of VUDs to be impacted by this alternative is not known, it is probable that at least 1,000 VUDs will be affected by selection of this alternative. Of these 1,000, at least 75 percent (or 750 VUDs) will be displaced to other areas. Because many areas are available for horseback riding in the vicinity of Barstow, the loss of opportunity for horseback riding is considered a less than significant impact.

Hunting and Shooting

Impacts on hunting and shooting activities will be the same as those described in the Modified Coyote Basin Alternative (Section 4.11.3.1).

4.11.5.2 Mitigation

The mitigation measure(s) below shall be implemented, subject to availability of funding.

Mitigation Measure 1 will apply to the Superior Valley Alternative. The following will also apply:

2. The NTC shall acquire the necessary right-of-way and upgrade Murphy's Well Road to a two-lane graded road suitable for the County road system and add a spur road to connect Murphy's Well Road and Superior Dry Lake 1.

3. The NTC shall post orders to the field soldiers to avoid Superior Dry Lake. Signs shall be erected near the lakebed at regular intervals to reduce

the potential of vehicle damage to the lakebed by NTC field operations.

4. The military shall construct a fence around Superior Dry Lake to reduce the risk of accidental military traffic on the lakebed.

5. The NTC shall provide access to Superior Dry Lake 1 on a conditional permit basis.

6. Barriers and signs shall be erected on Copper City Mine Road to warn the public of the approaching exercise area.

4.11.6 Avawatz Alternative

4.11.6.1 Impacts

Land Sailing

Superior Dry Lake 1 is not affected by the Avawatz Alternative; thus, no impacts from selection of this alternative will occur to land sailing.

Rock Hounding

Other Old Miocene deposits that will continue to be available and used by rock hounders under this alternative include Avawatz Mountains, Afton Canyon, Rainbow Basin, and Devil's Playground. Because these other areas would still be available, impacts on rock hounding are considered less than significant.

Sightseeing and Camping

This alternative will affect 137,600 acres of public lands. The impacts of this alternative will be similar to those expected from implementation of the Alvord Alternative with the additional impact on the privately owned Paradise Springs area. The exact number of VUDs to be affected by this alternative is unknown, but it is probable that 750 to 1,500 VUDs will be displaced to areas such as Opal Mountain, Black Canyon, Inscription Canyon, and Superior Valley. Because camping would still be available in these other areas, impacts on camping and sightseeing are considered less than significant.

Dispersed OHV Use

Approximately 100 miles of roads, trails, and washes will be removed from dispersed OHV use by this alternative. The lowest amount (about 1,500 VUDs) of use will be displaced from within the alternative area when compared with other action alternatives. Use will primarily be displaced to the Superior Valley area, but some will continue to affect the Fremont Peak area and lower the quality of the dispersed OHV use experience there, resulting in a less than significant impact.

Horseback Riding

This alternative has impacts similar to those discussed for the Modified Coyote Basin Alternative. It is likely that displaced users will use the Calico Mountains, Afton Canyon, and Superior Valley.

Hunting and Shooting

The impacts from displacement of hunting and shooting will be the same as those described under the Modified Coyote Basin Alternative (Section 4.11.3.1).

4.11.6.2 Mitigation

The mitigation for the Avawatz Alternative will be the same as that described under the Proposed Action (Section 4.11.1.2).

4.11.7 No Action Alternative

4.11.7.1 Impacts

Land Sailing

Recreational enthusiasts who participate in land sailing will continue to have access to use of Superior Dry Lakes 1 and 3 under the No Action Alternative. Recreation use on Superior Dry Lake 1 will continue with the No Action Alternative. Currently, no activities are foreseen that will take place on public lands within or near Superior Dry Lake 1 that will jeopardize the quality of the lakebed surface for land sailing. Potential adverse impacts on the lakebed surface by mineral-extracting activities are the largest threat to the dry lake surface from continuing multiple-use management by BLM. Superior Dry Lake is

currently undisturbed. Future anticipated uses of Superior Dry Lake 1 include increased use of the lakebed for ultralight and experimental aircraft; motorized, remote-control models; and windboarding.

Dispersed Recreation

Dispersed recreation opportunities include rock hounding, OHV use, sightseeing, camping, hunting, hiking, and horseback riding. As a group, dispersed recreationists have used public lands in the study area without the constraints of a limited period of use or a permit system. The No Action Alternative will result in no interruption of these activities on public land in the study area.

Rock Hounding

The No Action Alternative will result in continued rock hounding within the areas of Alvord Mountain, Spanish Canyon, and Lane Mountain. No other public land uses are foreseen that will have an impact on rock hounding.

Sightseeing and Camping

Occasionally, the Paradise Range, specifically Paradise Springs, is used for sightseeing by individuals and groups, subject to permission by the private landowner. The Spanish Canyon and Superior Lakes areas are used for camping. Under the Limited Use and Moderate Use Multiple Use classes under which recreational use occurs in the area, the No Action Alternative will allow continued dispersed camping within 300 feet of any road on public lands.

Dispersed OHV Use

This alternative will allow OHV use to continue on existing designated routes. Existing areas of high use include the Lane Mountain area, the power line roads, and OHV open areas outside the study area (Hamel, personal communication 1988). Route designation by the BLM is ongoing, and it is possible that some of the existing routes may be closed through BLM's processes. In addition, impacts on the desert tortoise associated with OHV use may cause future constraints to OHV use in the region. This will be accomplished through development of a desert tortoise HMP and evaluation of the HMP actions through the NEPA and Desert Plan Amendment processes. Both of these processes require public participation, which will be provided.

Horseback Riding

The No Action Alternative will allow horseback riding to continue within all portions of the study area. No actions are foreseen to occur on public lands within the study area that will foreclose the option to continue horseback riding here. While the exact number of horseback riding VUDs is unknown within study area, it is probable that at least 1,000 VUDs of horseback riding occur each year, contributing about $17,000 to the local economy.

Hunting and Shooting

The selection of the No Action Alternative will allow hunting and shooting to continue within the study area. Limited activity currently occurs, most of which is focused on the north side of the Calico Mountains. No management actions are foreseen at this time that will limit the opportunities for hunting or target shooting within the study area.

4.11.8 Cumulative Impacts

Increases in dispersed recreation demand are anticipated, and areas within the proposed expansion study area will be host to increased VUDs. Other activities occurring within the western Mojave Desert (Afton Canyon ACEC Management Plan, Rand Mountain/Fremont Valley ACEC Management Plan) have added constraints to dispersed recreation activities. Additional constraints will apply to wilderness areas designated by the CDPA. Restricted use of public lands from the Proposed Action and cumulative projects involving BLM-managed lands (the Ward Valley, Hidden Valley Resources, MCGCC Vehicle Corridor, and Fort Cady Minerals Projects) result in an adverse impact on those recreationalists who will be displaced to other areas where unconstrained recreational opportunities remain. This displacement of use, when coupled with anticipated increases in recreation use in the region, will eventually result in a significant decline in the quality of the recreation experience available in the region. Increased recreational use also includes related impacts on natural resources. Should substantial impacts occur to desert tortoise or its habitat near Fremont Peak,

recreational use here may also become more constrained or possibly even eliminated.

In particular, other actions have added significant constraints to the use of OHVs in specific areas that were previously destinations for dispersed OHV users. Much of this previous use has been displaced to other areas, and one of the most popular of these areas is the Fremont Peak/Cuddeback Lake area. Until recently, the Fremont Peak/Cuddeback Lake area had not received intensive OHV use, and the quality of the recreational experience there has been good. However, implementation of the above-mentioned management plans has caused a substantial increase in use and associated decrease in the quality of the recreational experience. The increased use of OHVs here may also cause adverse impacts on soil, vegetation, and desert tortoise habitat. The foreseen development of a desert tortoise HMP will implement constraints to OHV use here.

In addition to the above-mentioned impacts, recreational expenditures in the Barstow vicinity are anticipated to be reduced as the displacement of some activities (especially sightseeing, camping, and OHV use) transfers use to areas such as Fremont Peak/ Cuddeback Lake. Therefore, the cumulative impact of the Proposed Action and other activities in the region will result in a future significant adverse impact on the quality of dispersed recreational activities.

4.11.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.11-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.11-2.

Table 4.11-1

RECREATION - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz	No Action
Land Sailing	Impact from loss of use of Silurian Dry Lake.	Impact from loss of use of Silurian Dry Lake.	No significant impact.	No significant impact.	Significant impact from loss of use of Superior Dry Lake 1.	No significant impact.	No impact.
Rock Hounding	Impact from loss of use of Avawatz Mountains.	Impact from loss of use of Avawatz Mountains.	Impact from loss of use of South Avawatz Mountains, Alvord Mountain, and Spanish Canyon.	Impact from loss of use of Alvord Mountain and Spanish Canyon.	Impact from loss of use of Lane Mountain, Alvord Mountain, and Spanish Canyon.	Impact from loss of use of Alvord Mountain and Spanish Canyon.	No impact.
Sightseeing and Camping	Impact from loss of use of 310,296 acres of public lands.	Impact from loss of use of 253,300 acres of public lands.	Impact from loss of use of 196,914 acres of public lands, including Spanish Canyon and Paradise Springs camp areas.	Impact from loss of use of 168,700 acres of public lands, including Spanish Canyon camp area.	Impact from loss of use of 202,254 acres of public lands, including Spanish Canyon and Paradise Springs camp areas.	Impact from loss of use of 137,600 acres of public lands, including Paradise Springs camp areas.	No impact.
Off-Highway Vehicle (OHV) Use	Impact from restricted use of 35 miles of maintenance road and several trails.	Impact from restricted use of 5.5 miles of maintenance road and several trails.	Impact from restricted use of 136 miles of trail, including 35.5 miles of maintenance road.	Impact from restricted use of 136 miles of trail, including 35.5 miles of maintenance road.	Impact from restricted use of Superior Valley area and 100 miles of trail.	Impact from restricted use of 100 miles of trail.	No impact.
Horseback Riding	No significant impact.	No significant impact.	Impact from loss of use of a portion of the Superior Valley.	No significant impact.	Impact from loss of use of northern end of Mud Hills, Lane Mountain, Spanish Canyon, and Paradise Valley.	No significant impact.	No impact.
Hunting and Shooting	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No impact.

Table 4.11-2

RECREATION - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Land Sailing	Impact remains the same.	Impact remains the same.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains significant.	No significant impacts are expected. No mitigation is required.
Rock Hounding	Impact remains the same.	Impact remains the same.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.
Sightseeing and Camping	Impact remains the same.	Impact remains the same.	Impact remains significant.	Impact remains the same.	Impact remains significant.	Impact remains significant.
Off-Highway Vehicle (OHV) Use	Impact remains the same.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	Impact remains the same.	Impact remains significant.	Impact remains the same.
Horseback Riding	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	No significant impacts are expected. No mitigation is required.
Hunting and Shooting	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.

4.12 MINING

Impacts on mineral exploration and development associated with implementation and operation of the various project alternatives are discussed below. In performing this evaluation, the following significance criteria were applied:

The impacts of the Proposed Project on mineral exploration and development were considered significant if:

- project implementation will result in an irrevocable loss of established or potential mineral bearing resources of economic value,
- project implementation will result in the loss of mining jobs within the region,
- project implementation will render local mineral resources inaccessible and therefore require mineral commodities to be transported from source areas at greater distances from the local markets, and/or
- project implementation will result in a loss of state and local tax revenues in excess of $1 million dollars per year as a consequence of decreased mineral production.

With the exception of the No Action Alternative, all of the alternatives under consideration will require the Department of the Army to withdraw all public domain lands in their respective expansion areas from the operation of the mining and mineral leasing laws. Such action will prevent filing of new unpatented mining claims within the lands withdrawn. All mining claims, leases, and permits existing within the selected alternative area before the effective date of the withdrawal will, under the proposal, be verified as to the validity of any preexisting rights. Undeveloped valid existing rights (VERs) will be purchased through offer or condemnation by the Department of the Army.

Direct and immediate effects of land acquisition upon the mineral resources and their utilization will be limited within the study area. Only one producing mine and several quarries are currently in operation. None will be shut down by the Army's Land Acquisition Project for the NTC.

Future potential impacts of land acquisition are more difficult to forecast. Lack of deposit definition, timing of potential development, and estimates of mineral quantities that might be extracted are speculative. However, locatable and leasable minerals in the CDCA Category I and II mineral commodity groups, as well as construction material groups having high to medium potential for future development, are known to exist within the study area. Potential for uranium minerals in the study area is also believed to be medium to high. Should conditions warrant and development occur, all of these resources have the potential for generating significant numbers of jobs and revenues.

One cautionary note must not be overlooked. Mineral extraction processes will normally have effects on competing users of water, roads, and land. Historic mining operations throughout the study area have been constrained by lack of water supplies in the arid Mojave Desert. Entitlements to water resources in much of the study area are now subject to judicial review and allocation determination. The future water availability to mining claimants is unclear at this time, pending court decisions establishing allocations for competing users throughout the desert.

The following discussion focuses chiefly on the impact that land withdrawal will have on five CDCA Category I commodities identified as having a medium to high potential for occurrence within the study area and on the four resource models evaluated by the BOM in the Silurian Valley. The mineral resources include borate beds; epithermal quartz-alunite gold veins; rare-earth veins; wollastonite skarn, zeolite, talc, and salt deposits; lead-silver veins; and gneiss-hosted, disseminated gold deposits suitable for open pit extraction. Although quantification of the mineral potential of all deposit types that occur within the study area was not practicable, the BOM judged the above categories to be potentially the most economically significant regionally.

4.12.1 Proposed Action

4.12.1.1 Impacts

Demand for access to private and public lands for the purpose of mineral exploration and development is expected to continue to increase over the long term. This will not change as a result of implementing any of the alternatives, including the No Action Alternative with its associated subsequent designation of approximately 200,000 acres of new wilderness areas by Congress.

The demand for mineral commodities is expected to increase regardless of the alternative selected. Those lands that are not withdrawn from mineral entry will remain subject to exploration and development under existing mining and mineral leasing laws.

Withdrawal of public land for military purposes will restrict exploration for mineral supplies. Additionally, such a withdrawal could deny southern California an alternate source to augment the region's supplies of industrial/chemical primary resources and accessible construction materials.

Due to the geographic overlap among the various alternatives being considered, each will impose limits on commercial development of mineral deposits in portions of the study area, as will the No Action Alternative because of the associated subsequent Congressional action to designate new wilderness areas in the Silurian Valley and adjacent mountain ranges. The choice of any of the alternatives will adversely impact exploration and development attempts for these commodities under current mining law.

In evaluating opportunity costs for this study, it is assumed that future development of one of each deposit type will not occur. It is further assumed that Congress will not pass legislation to open Fort Irwin and any added lands to a pilot mineral leasing program similar to the existing DOD leasing program for oil, gas, and geothermal resources. Therefore, potential losses in jobs, local and state taxes, and mining purchases are estimated to be comparable to the range of economic activity evaluated in Section 3, which is summarized in Table 4.12-1. These values reflect only the potential of the deposit types evaluated and do not include other mineral resources or existing mining concerns.

Table 4.12-1

ADVERSE IMPACTS OF PROPOSED ACTION

Impact	Small	Medium	Large
Jobs Lost	682	1,554	3,247
Taxes Lost Per Year	$ 836,000	$ 3,418,000	$10,343,000
Mine Purchase Per Year	$10,561,000	$35,515,000	$95,960,000

All alternatives (except the Proposed Action) will adversely impact access and availability of mineral resources through withdrawals from the mining and mineral leasing laws. Future access to mineral resources in areas under this alternative are uncertain and are assumed to be irrevocable.

4.12.1.2 Mitigation

The following mitigation measure(s) shall be implemented, subject to availability of funding:

1. Valid mineral interests within the proposed withdrawal shall be considered for acquisition except those mining and exploratory operations ongoing at the time of the withdrawal that the Army has determined will not interfere with the NTC mission. Mineral resource development and mineral surface activity within the withdrawal on mining claims with valid existing rights, leases, contracts, or permits on federal land will be managed under the authority of the Secretary of the Interior by the BLM (43 U.S.C. 158). Regulations at Title 43 CFR 3809 will be used to implement the BLM's surface management and reclamation oversight responsibilities on unpatented mining claims. Authority also exists for BLM management of leasable and salable mineral resources under the same title. Private mineral interests within the preferred alternative will be purchased by the Army under appropriate acquisition authority. Mineral lands acquired by the Army will not be considered public lands included in the proposed withdrawal but could be made available for mineral leasing under enabling legislation sought by BLM and the NTC. The threshold for determining whether mineral activity will be allowed will be based on an evaluation of mission and environmental compatibility in accordance with specific legislation authorizing the withdrawal.

2. If in the future the U.S. Army determines that withdrawn lands are no longer needed and/or that mineral development will not affect the mission of the NTC, development of hardrock mineral interests (minerals subject to location or sale as defined in the regulations at 43 CFR 3500.05 (n) acquired by the Army will be available under appropriate mineral law administered by the BLM after such lands either reverted back to the public domain or were

determined to be available for exploration or development under the pilot leasing program sought by the BLM and the NTC.

3. Mineral development proposals on unpatented mining claims that have not exhibited ongoing mineral development activity as of the date of the withdrawal will be examined to determine if they have VERs. Those which do not will be contested. Those unpatented claims that do have VERs will be acquired by the Army. The NTC may consent to the development of a VER on a case-by-case basis, having first determined that such development will not interfere with the NTC mission. Any permitted development will be in accordance with appropriate BLM regulations and under restrictions protecting the NTC mission. Just compensation for any decrease in the value of VERs will be paid by the Army.

4. Private mineral interests acquired by the Army may be available for permit, lease, and development of coal, phosphate, oil, oil shale, gilsonite (including vein-type solid hydrocarbons), gas, sodium, potassium, and sulfur under the authority of the Acquired Lands Leasing Act of August 7, 1947 (30 U.S.C. 351,352). Applications for the above minerals will be reviewed by the Army to assure that such lease will be consistent with the purpose and intent of the NTC. Permits and leases will be administered by the BLM and subject to such stipulations ensuring that the mission of the NTC will not be affected. Development of hardrock mineral interests (minerals subject to location or sale as defined in the regulations at 43 CFR 3500.05(n)) acquired by the Army will be authorized under appropriate mineral law administered by the BLM after such lands revert to the public domain pursuant to a determination by the U.S. Army that the withdrawn lands are no longer needed and that mineral development will not affect the mission of the NTC, or under a pilot leasing program pursuant to special legislation sought by the BLM and the NTC.

5. The area proposed for withdrawal shall be reviewed for the appropriateness of segregation from entry under the mining laws every 5 years following the effective date of the withdrawal. Such review shall be in accordance with the procedures and requirements of Section 204 of the FLPMA. Post-withdrawal mineral authorizations, leases, permits, contracts, or locations could be allowed. Any authorization shall require specific legislation allowing for such use and shall be limited to the provisions of existing statutes (43 U.S.C. 158). All use approvals shall be managed by the BLM in accordance with existing laws and regulations. Any use authorizations will be subject to the concurrence of the NTC, and post-authorization exploration or mining plans of operation will have to be conducted in such a manner as not to adversely affect the purpose of the NTC expansion and mission of the NTC.

4.12.2 Modified Avawatz-Silurian Alternative

4.12.2.1 Impacts

The impacts for the Modified Avawatz-Silurian Alternative are similar to those discussed under the Proposed Action. Losses in jobs, local and state taxes, and mining purchases for the five selected commodities are estimated by the use of mine models to be in the range listed in Table 4.12-1.

4.12.2.2 Mitigation

Mitigation measures to reduce impacts on mineral resources resulting from implementation of this alternative will be similar to those described for the Proposed Action in Section 4.12.1.2.

4.12.3 Modified Coyote Basin Alternative

4.12.3.1 Impacts

Known occurrences and favorable terrains indicate more likelihood of gold deposits for the Modified Coyote Basin Alternative in comparison to some of the other action alternatives. It is assumed that potential development of two epithermal gold deposits and one each of four deposit types will be impacted and prevented.

Based on the five mine models developed by the BOM, losses in jobs, local and state taxes, and mining purchases for the selected commodities are estimated to be in the range listed in Table 4.12-2. Losses for other commodities and deposit types will be in addition to these.

Table 4.12-2

ADVERSE IMPACTS OF MODIFIED COYOTE BASIN ALTERNATIVE

Impact	Small	Medium	Large
Jobs Lost	796	1,710	3,625
Taxes Lost Per Year	$ 909,000	$3,615,000	$10,679,000
Mine Purchase Per Year	$10,977,000	$36,583,000	$97,667,000

4.12.3.2 Mitigation

Mitigation measures to reduce impacts on mineral resources resulting from implementation of the Modified Coyote Basin Alternative will be similar to those described for the Proposed Action in Section 4.12.1.2.

4.12.4 Alvord Alternative

4.12.4.1 Impacts

In addition to the general discussion of impacts under the Proposed Action, this alternative has fewer current mining claims but includes areas with six of the terrains of high to moderate potential. It is assumed that potential development of one of each five deposit types modeled by the BOM will be impacted and prevented.

Losses in jobs, local and state taxes, and mining purchases for the five selected commodities are estimated by use of five mine models to fall in the range listed by Table 4.12-2. Losses for other commodities and deposit types will be in addition to these. Estimates of these impacts at this time can only be characterized in this extremely broad range of possibilities.

4.12.4.2 Mitigation

Mitigation measures to reduce impacts on mineral resources resulting from implementation of the Alvord Alternative will be similar to those described for the Proposed Action in Section 4.12.1.2.

4.12.5 Superior Valley Alternative

4.12.5.1 Impacts

The estimate of impacts for the Superior Valley Alternative is unchanged from that of the previous Modified Coyote Basin Alternative estimate. It is assumed that potential development of two epithermal gold deposits and one each of four other deposit types will be impacted and prevented.

Losses in jobs, local and state taxes, and mining purchases for the five selected commodities are estimated by the use of mine models to be in the range listed in Table 4.12-2.

4.12.5.2 Mitigation

Mitigation measures to reduce impacts on mineral resources resulting from implementation of this alternative will be similar to those described for the Proposed Action in Section 4.12.1.2.

4.12.6 Avawatz Alternative

4.12.6.1 Impacts

Although the Avawatz Alternative has somewhat fewer known occurrences than other alternatives, it has five of the geologic terrains considered to have high to moderate potential for most deposit types included in this study. It is assumed that development of one of each five deposit types will be impacted and prevented.

Losses in jobs, local and state taxes, and mining purchases for the five selected commodities are estimated by the use of mine models to be in the range listed in Table 4.12-1.

4.12.6.2 Mitigation

Mitigation measures to reduce impacts on mineral resources resulting from implementation of the Avawatz Alternative will be similar to those described for the Proposed Action in Section 4.12.1.2.

4.12.7 No Action Alternative

Under the No Action Alternative, approximately 100,000 acres of public lands will be restored to operation of the mining and mineral leasing laws by termination of the land segregation associated with the Army withdrawal application.

4.12.8 Cumulative Impact

These impacts on limitation or prohibition of future exploration and potential development due to land withdrawal would be cumulative to the 219,173 acres of public lands withdrawn from mineral location and leasing by the CDPA wilderness and park designations in the region.

4.12.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.12-3. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.12-4.

Table 4.12-3

MINING - SUMMARY AND COMPARISON OF ECONOMIC EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Significant impact from potential jobs lost	Small production level - 682 jobs to large production level - 3,247 jobs.	Small production level - 682 jobs to large production level - 3,247 jobs.	Small production level - 796 jobs to large production level - 3,625 jobs.	Small production level - 796 jobs to large production level - 3,625 jobs.	Small production level - 796 jobs to large production level - 3,625 jobs.	Small production level - 682 jobs to large production level - 3,247 jobs.	No change from current conditions.
Significant impact from potential taxes lost	Small production level - $836,000 to large production level - $10,343,000	Small production level - $836,000 to large production level - $10,343,000	Small production level - $909,000 to large production level - $10,679,000	Small production level - $909,000 to large production level - $10,679,000	Small production level - $909,000 to large production level - $10,679,000	Small production level - $836,000 to large production level - $10,343,000	No change from current conditions.
Significant impact from cost of mine purchase per year	Small production level - $10,561,000 to large production level - $95,960,000	Small production level - $10,561,000 to large production level - $95,960,000	Small production level - $10,977,000 to large production level - $97,667,000	Small production level - $10,977,000 to large production level - $97,667,000	Small production level - $10,977,000 to large production level - $97,667,000	Small production level - $10,561,000 to large production level - $95,960,000	No change from current conditions.

Table 4.12-4

MINING - SUMMARY OF ECONOMIC EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Significant impact from potential jobs lost	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.
Significant impact from potential taxes lost	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.
Significant impact from cost of mine purchase per year	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.	Impact reduced to less than significant.

4.13 UTILITY CORRIDORS

Utility Corridors

A detailed utility risk analysis (URA) has been developed as a confidential appendix to this document and is retained by the NTC. Confidentiality is due to proprietary information supplied by the utility companies concerning operational characteristics and customer/user demographics. This document can be reviewed by individuals authorized by the NTC. Nonsensitive information from the URA was used in this section to evaluate the potential impacts on existing and proposed utilities in and around the proposed expansion of the NTC and the impacts on the easement status of the corridors that may be caused by the expanded military warfare training operations.

Technical issues addressed in the URA that may affect the ability of the utilities to provide their services are discussed in this section as impacts. These issues include (1) potential for conflict between physical utility structures and military operations involving vehicles, aircraft, and other equipment/personnel; (2) secondary physical effects such as erosion, vibration, and dust; (3) conflict between the utility companies' electromagnetic communications (i.e., radio transmissions) and military communications; (4) impedance of utility company maintenance and repair efforts by the military's training schedule and/or exclusion from the base for security reasons; and (5) planned future utility development/needs and the impacts from the loss of such.

This section stipulates mitigation of these real and potential impacts and includes the feasibility of relocating utilities within and outside of the NTC acquisition area.

Impact Significance Criteria

The potential impacts on a utility are a function of whether the utilities are within the specific alternative, whether they are within the maneuver area where tactical and support vehicles will travel to an engagement area, such as in the Proposed Action and the Modified Avawatz-Silurian Alternative, and whether they are within an area where force-on-force engagement of tactical vehicles will probably occur, such as the southern acquisition alternatives.

Impacts are considered significant based on the following criteria:

- substantial conflict occurs with accessibility to perform maintenance and emergency repairs,
- substantial conflict occurs with future additions and deletions to existing utility corridors, and/or
- damage to utility facilities and equipment results in requiring repairs and/or disrupting service that cannot be automatically reestablished.

4.13.1 Proposed Action

4.13.1.1 Impacts

The relative area in square miles of utility corridors that will be encompassed and possibly impacted by the Proposed Action and the five other alternatives under consideration is listed in Table 4.13-1.

Table 4.13-1

UTILITY CORRIDOR AREAS POTENTIALLY AFFECTED BY THE PROPOSED LAND EXPANSION

Alternative	Corridor BB	Corridor D (Boulder)	Corridor Q	Total sq/mi
Proposed Action	NA	70	NA	70
Modified Avawatz-Silurian	NA	12	NA	12
Modified Coyote Basin	NA	71	42	113
Alvord Mountain	NA	71	8	79
Superior Valley	NA	NA	42	42
Avawatz	NA	NA	30	30

Within each alternative, there are various utility companies that either have utility lines, communications equipment, service lines supplying power to equipment, and/or support equipment. The majority of this equipment is within the established utility Corridors D, Q, and BB. However, some of this equipment traverses the alternative areas through public and private easements.

The Proposed Action almost exclusively involves only Utility Corridor D. The reach of utility facilities in the maneuver area will be approximately 70 miles. The utilities that could be potentially impacted by the Proposed Action are described below.

Los Angeles Department of Water and Power

Transmission Lines

The LADWP has four transmission lines in Corridor D. NTC activities have the potential to damage these transmission lines, affect maintenance activities, and alter operational procedures. The transmission lines in the corridor provide 70 percent of the power needs in the greater Los Angeles area under normal operating conditions. In addition, the LADWP has other sources of electricity that are networked together with the Western System Coordinating Council (WSCC).

The potential for damage to the transmission lines is greatest from tactical vehicles (i.e., tanks and armored personnel carriers) because of the mass of the vehicle and the limited visibility under certain operational conditions. Other vehicles also pose a threat to the transmission towers in proportion to their mass, speed of travel, braking capabilities, and operator visibility. The lattice steel member transmission towers are designed for wind, seismic activity, and static loads from the conductor cables. The legs are susceptible to buckling if struck by a vehicle and could contort the geometry of the structure and cause secondary buckling of the diagonal bracing. This in turn exacerbates the damage to the structure. The greatest danger is expected to be in areas where the vehicles are expected to pass between the transmission towers. During the confusion of an exercise, and with the dust and smoke generated during the exercise, the potential exists that vehicles maneuvering near a tower may have a collision. The potential also exists for damage to the transmission lines from fixed and rotary wing aircraft. Thus, significant impacts could potentially occur from such accidents.

LADWP's system has been designed to withstand different scenarios for line outages. If supplemental power is needed, it can be requisitioned from other utility companies in the WSCC system if available. These suppliers generate additional power that might be required to burn emergency fuels that are not as energy efficient or pollution free as those normally used. Additionally, LADWP could be faced with fines by the South Coast Air Quality Management District for exceeding air quality standards in the Los Angeles area while during emergency situations.

Currently, LADWP calculates a loss of load probability as one event in 10 years, meaning that it will have adequate generating capacity such that demand will not exceed capacity more than 1 day in 10 years assuming no electrical system damage.

If a two-line outage is incurred during heavy power demands (e.g., during summer), the outage may cause heavy load demand in the WSCC system. The result of this instability will likely cause power disruptions in some areas throughout California. This will be a significant impact. The physical reconstruction of the towers will take the same as a one-line outage.

Based on the importance of these lines and the impacts that could occur, damage to even one line is classified as significant, whereas damage to more lines, which will affect the deliverability of power, will be more significant.

LADWP requires immediate access to its utilities for emergency repair. Based on the repairs that are required, access may be by land and/or air. If repairs are necessary within the Proposed Action, repair personnel will have to contact the NTC Emergency Operations Center (EOC), which is staffed 24 hours a day, to announce the nature of the emergency and the area they needed to access.

LADWP performs maintenance repairs and inspection of the lines and towers by land patrols 10 to 15 times per year. In addition, a low-flying helicopter patrols the lines approximately five times per year. Being within the NTC will require maintenance personnel to notify the NTC EOC for access permission. The maintenance personnel will schedule their routine inspections with the NTC EOC and could perform inspections between rotations or in some cases during rotations in areas that were not currently being used for maneuvers.

Presently, LADWP does not clean the insulators on a regular basis. However, military vehicle maneuvers increase the likelihood that dust raised will settle on the insulators. This may require LADWP to incorporate different types and extra insulators and/or periodic routine washing of insulators to maintain electrical integrity. This will result in a moderate impact.

With the Proposed Action, OHV access to LADWP right-of-way will be significantly reduced. Therefore, transmission lines and access roads inside the NTC will have better security and may need less maintenance for road and insulator damage. This will result in a beneficial impact.

WILLTEL Fiber-Optic Cable System

This cable carries WILLTEL's regular U.S. network of telephone lines. This buried fiber-optic cable is located in Corridor D and will be susceptible to damage at locations where tracked vehicles or heavy traffic passes over it. Loss of this line will severely limit WILLTEL's ability to service its customers. There could be some rerouting of signals, but WILLTEL's overall service capability will be significantly impacted. Thus, the potential for significant impacts exists where tactical vehicles will cross the corridor and where it is possible that lighter military vehicles will traverse the corridor and possibly erode ground cover over the cable.

A fenced regeneration/repeater station is also located in Corridor D, between the LADWP utility lines, but not within the boundaries of the Proposed Action. Therefore, the regeneration/repeater station will not be impacted.

Maintenance of the cable is not normally required. In case emergency repair is necessary, WILLTEL will need to gain access to the damaged portion of the line. If WILLTEL is not able to access the line because of military activities, there will be a significant impact on WILLTEL's ability to maintain the cable.

Vandalism has not been noted as a problem with the cable or the repeater station; however, it has been noted as a problem with access roads and the power service line. Thus, being within the confines of the base could have a beneficial impact.

Kern River Gas Transmission Pipeline

This pipeline follows Corridor D and is buried below Department of Transportation minimum depths. It will not be particularly vulnerable to damage from maneuvers unless it becomes uncovered and is then struck by a tactical vehicle (i.e., tank or other heavy piece of equipment). In this case, the pipeline could be punctured or broken, resulting in the release of large amounts of flammable gas.

Two aboveground block valve locations, which are fenced, provide the pipeline with automatic shutoff and isolation capability for emergency response and repairs. Some potential for damage to the fence exists, but it is assumed under such a circumstance that the vehicle will not proceed further and damage the valves. If this happens, it will result in a significant impact. Thus, taking into account that the pipeline is buried and at crossing points the ground may erode from vehicle action, there is moderate potential for physical damage to the pipeline and valves.

Damage to the pipeline could result in an explosion from the flammable natural gas. Damage to the gas transmission pipeline, which may result in an explosion, would very likely damage overhead electrical transmission lines causing at least one line outage and extensive damage. This damage would be most serious where the gas pipeline proceeds under the overhead electrical transmission lines. Disruption of gas service to the oil fields in the Bakersfield area may also result from damage to the pipeline. While the loss of gas may result in delays in oil recovery, it should not cause any damage to the oil reservoirs themselves. Because of the potential for explosions and resulting damage to transmission lines, and because future industrial user may be affected, there is a potential for a significant impact from damage to the pipeline.

The line is only required to be inspected annually and then only by aircraft. This inspection will require coordination with NTC EOC. In addition, the valve stations located within the proposed expansion areas will also have to be inspected annually. This will require approved access by the NTC EOC. Inspections and emergency repair are expected to be impacted.

One of the most common causes of pipeline damage results from third-party excavation activities. Being within the confines of the base should reduce the possibility of this type of problem and be of some benefit.

The option of relocating the LADWP's four transmission lines is cost prohibitive -- $2.5 million (in 1988 dollars) per mile. The new corridor with four transmission lines may be about 50 miles long and cost in excess of $125 million (in 1988 dollars) (LADWP 1988). This includes only demolition and construction costs and does not take into account land acquisition or fees. The realignment of the utility corridor will require U.S. Congressional approval based on substantial and lengthy feasibility and environmental analyses. The Coyote Ground Electrode will also need to be relocated. If this was accomplished, the Kern River gas pipeline and the WILLTEL fiber-optic cable will in all likelihood also be relocated with the transmission towers, which will compound the cost substantially.

Due to technical reasons, it will probably not be possible to relocate the ground electrode facility farther south and outside of the Proposed Action boundaries because the installation will be located too close to the underground Kern River pipeline and/or the Union Pacific Railroad tracks. Both could potentially act as conductors to disperse current dumped into the ground from the electrode system. The new area selected for relocation of the electrode will also have the necessary lithologic and soil/moisture characteristics. Therefore, geophysical studies will be required.

An estimate of the cost to relocate the electrode is about $30 million (in 1988 dollars). The relocation of the associated microwave facility will be $750,000 (in 1988 dollars). A minimum of two other repeater sites will cost $16 million (in 1988 dollars) (LADWP 1988).

Impacts Attributable to Radio Frequency Interference

Radio frequency interference impacts were investigated in the URA to evaluate possible impacts of military operations on utilities-owned communications equipment in and adjacent to the Proposed Action. The possible disruption of existing utility communication and telemetry equipment caused by military communications was investigated. The disruption of military communications by existing utility and telemetry equipment was not investigated. Military operations do not use frequencies at or near those stated to be in use by the utility companies.

The KRXV FM repeater station is located on Calico Peak. A civilian group shares a government frequency between the 444- and 451-megahertz range. This group is licensed to use these frequencies under the auspices of the military taking them over whenever they wish. The civilian group can be temporarily suspended from using these frequencies by the military through the Radio Spectrum group. Therefore, since there are not conflicts, no impacts will result.

The possibility of indirect interference is difficult to evaluate, but certain factors can be considered and conclusions drawn that will indicate a fairly low risk. The military personnel maintaining communications equipment are well trained and equipped. This reduces the risk of faulty equipment. The immediate risk to broadcast disruptions can occur to microwave facilities if rotary-winged aircraft hover within 300 feet of the transmission beam. Atmospheric contamination from dust attributable to wind cannot be avoided, but the existing facilities are designed against this by their location on high points. The scattering of microwaves from dust induced from vehicles will be minimal.

Impacts on Future Utilities Inside the Proposed Alternatives

The Mead-Adelanto 500-kV transmission line is planned for Corridor Q, which does not occur within the boundaries of the Proposed Action. No impacts are expected to this transmission line.

Fiber-Optic Cables

Communication companies have submitted plans for the construction of new fiber-optic cables and support equipment in Corridor D. When a new line is installed along Corridor D in the same manner as the existing WILLTEL line, it will take about 4 months to complete work. During this time, the crews would require daily access to any point along the corridor to bring in equipment. Installation of the cable would occur at different intervals than its testing and splicing. There would also need to be a few repeater stations installed and a primary power source brought to these stations, most likely from SCE. Under these circumstances, the NTC would need to accommodate the construction project to the extent necessary to avoid endangering the crews or impeding access to the work areas. The installation of the cable could not be staggered around NTC rotations because of the repeated mobilization costs involved. Because there are no current plans for installation of new cables, services, or equipment, there will be no impacts at the present time from implementation of the Proposed Action. However, there is a potential for conflict with NTC operations if new cables, services, or equipment are planned in the future. The training maneuvers will have to be limited to areas outside of the construction zone while new utilities are put in place.

Fuel Pipelines

If other pipelines are constructed in the corridor in the future, the construction would conflict with NTC operations. This conflict would be limited to the length of the construction period. Impacts after the pipeline is installed would be similar to those previously discussed for the Kern River Pipeline.

The typical pipeline construction process requires constructing access roads, grading the right-of-way, trenching, pipe joining/laying, backfilling, and restoring the right-of-way. It will also be expected that a block valve (or valves) will be constructed along the pipeline.

The overall construction time for a new pipeline, assuming it is within Corridor D and is the same size as the Kern River Pipeline, would take 3 to 6 months. During this time, training exercises would have to be limited to areas outside of the construction zone.

Military Communications Facilities

Four additional microwave support towers will be needed to correctly evaluate and score NTC operations and activities for an expanded operation. Each facility is a 4-foot-wide by 2-foot-long by 20-foot-tall tower. The exact geographical locations for the additional multiple integrated laser engagement system (MILES) facilities A Towers have not yet been determined. It is anticipated that future locations of MILES facilities will be at strategic positions on topographic high points surrounding the selected alternative. Because of the low operating frequency of the MILES system and the remote location of these facilities, interference generated by additional MILES facilities will not increase. Implementation of additional MILES facilities is not anticipated to have significant adverse effects on adjacent telecommunication facilities (USDOA/NTC 1988a).

The Army has committed to implementing special design considerations, such as filtering the low-powered MILES laser transmitters and additional microwave support towers (A Towers) to avoid impacts on the surrounding radio/telecommunication facilities. Proper bandwidth separation will be maintained between other electronic broadcast systems in the study area. Additional environmental documentation will be performed on MILES facilities and instrumentation units to ensure that they will not interfere with other sensitive receptors and microwave stations.

Impacts on Utilities Adjacent to the Proposed Action

Some potential physical and operational impacts on utilities located adjacent to the proposed acquisition area were identified. However, no impacts on maintenance/inspection or emergency repair access were found. The impacts are discussed below.

US Sprint Fiber-Optic Cable

This cable is located south of the NTC, outside of the study area. However, the cable passes through the Manix area, which the military uses to load/offload tanks and other vehicles to/from trains. Where this operation occurs, US Sprint has deepened the burial depth, encased the cable in concrete, and posted an emergency number above ground in case of damage to the cable. The Proposed Action does not include the US Sprint cable; thus, there will be no impact.

AT&T

A coaxial cable and a fiber-optic cable are located together, south of the NTC, outside of the study area. The Manix Trail used to transport tanks and other vehicles to the NTC crosses this cable. AT&T has placed the cables in a protective crossing through this area. There is a potential for damage if vehicles cross the cables at locations that are not protected. The coaxial cable is not as susceptible to vibration as is the fiber-optic cable, but radio communications within 100 feet can cause interference problems with the coaxial cable. Because the coaxial and fiber-optic cables are located outside of the study area, there will be no impacts from the Proposed Action.

4.13.1.2 Mitigation

The Army has committed to implement the following mitigation measures to avoid significant impacts on existing and future utility corridor uses, subject to availability of funding. The mitigation measures vary in applicability based on the alternative and are provided below.

Utilities Located Inside the Proposed Action Area

Following is a discussion of the mitigation measures for utilities inside the Proposed Action area.

Establishment of an Army Point-of-Contact

The utility companies require continued unimpeded access to their lines and equipment encompassed inside

the Proposed Action boundaries. It is paramount that they are permitted this access to make immediate repairs of malfunctions, fix broken equipment from accidents, control natural disasters threatening a utility, protect lives, and reestablish service as quickly as possible.

1. The NTC shall establish a 24-hour staff to coordinate utility company access for maintenance, inspection, and repair.

2. A separate road will be constructed by the NTC that is outside the transmission tower lines so military vehicles can drive parallel to the existing utility corridor.

3. Crossing areas will be established that adhere to the following criteria: (1) the crossing area will, when possible, be at a midway point between the towers; (2) protective barriers will be erected or permanently installed in areas where bottlenecking of vehicles occurs prior to or after crossing to prevent tracked vehicles from colliding with adjacent transmission towers; (3) engagements with the OPFOR will be restricted from occurring within 3 miles from the transmission lines; and (4) the crossing area will be excavated below grade to assure the necessary clearance between the booms of the tracked towing vehicles and the conductor lines.

4. Flight markers will be installed on the outside conductor lines.

5. Rotary-winged aircraft shall be restricted to designated air sectors away from transmission lines.

6. To mitigate conflicts between utility company and military rotary-winged aircraft, the utility company will schedule its maintenance fly-overs with the point of contact (POC) at the NTC.

7. WILLTEL fiber-optic cable shall be protected by either an underground encasement for fiber-optic cable to pass through and/or deeper burial depth at the designated crossing points.

8. The natural gas pipeline shall be marked sufficiently along its route and especially in the crossing areas to indicate its location and provide a warning not to dig in the vicinity.

9. The two block-valve locations for the pipeline shall be protected by installing concrete bollards or steel pipes with suitable footings around the existing chainlink perimeter fence. Reflectors shall be installed on each fence.

4.13.2 Modified Avawatz-Silurian Alternative

4.13.2.1 Impacts

The Modified Avawatz-Silurian Alternative will not involve any utilities except for a small portion of Corridor D. At the southwestern corner of the alternative's boundary, a transportation corridor is proposed to provide access from Fort Irwin to the expansion area. This road will be compacted dirt, 5½ miles long, and 100 feet wide. While the majority of the road will be within Corridor D's 2-mile right-of-way, the road will only cross the existing utility lines at two points.

At these points, potential impacts on Corridor D will be similar to those discussed under the Proposed Action. However, the area involved will be greatly reduced from the 70 square miles of Corridor D encompassed by the Proposed Action to 12 square miles under the Modified Avawatz-Silurian Alternative. The potential impacts on utilities from vehicle crossings will be localized to two areas. This will allow for greater control to prevent accidents and more ease in performing inspections and/or repairs as needed. Though the potential to impact utilities is greatly reduced with this alternative, the potential to damage utilities within the small portion of Corridor D still may result in a significant impact.

4.13.2.2 Mitigation

The Army has committed to implement mitigation measures to avoid significant adverse impacts on existing and future utility corridor uses, subject to availability of funding. The mitigation measures vary in applicability based on the alternative. Those necessary to mitigate the impacts of the Modified Avawatz-Silurian Alternative are provided below and listed in Table 4.13-2.

Implementation of Mitigation Measures discussed above for the Proposed Action will reduce the impacts on the transmission lines in Corridor D.

4.13.3 Modified Coyote Basin Alternative

4.13.3.1 Impacts

The Modified Coyote Basin Alternative encompasses all of the utilities discussed under the Proposed Action. Comparatively, the Modified Coyote Basin Alternative has the second greatest overall potential to affect the utilities (LADWP transmission lines, WILLTEL fiber-optic cable, and the Kern River pipeline) in Corridor D after the Alvord Alternative. Although the extent of the maneuver area affecting Corridor D for this alternative is represented as somewhat smaller than the Alvord Alternative because the area northeast of Red Pass Lake is included, a force-on-force engagement area is not represented near the corridor as in the Alvord Alternative. The reach of utility lines in the maneuver area will be about 51 miles as compared to 66 miles in the Alvord Alternative.

In addition, the potential impacts described below may be associated with this alternative.

Southern California Edison

SCE provides power to the NTC and the majority of utility facilities within the NTC expansion area. The potential impacts on these services are discussed below.

SCE Coolwater-Tiefort Subtransmission Line

The Coolwater-Tiefort subtransmission line in conjunction with the Barstow Remote line provides primary power to Fort Irwin and the Goldstone Communications Complex. The conductors for this line are carried on wooden poles spaced approximately 530 feet apart. The corner poles have counterpoise to support them. These poles are susceptible to damage from all vehicles. It will only take a minor collision to damage a pole and cut off power. A loss of power resulting from a collision with the poles supporting this line would result in a significant impact.

This line was installed before the present Public Utility General Order No. 95 Rule 37 was effective governing conductor height above the ground. This line may not have adequate clearance between conductors and vehicles with high antennas or booms passing underneath. The lack of adequate clearance could result in a significant impact because the potential for accidental grounding of the line (which will disrupt power) and electrocution to vehicle passengers is possible.

Because both Fort Irwin and the Goldstone Communications Complex have limited backup power, disruption of service will result in significant impacts on both. A loss of the Coolwater-Tiefort line will result in disruption of the MILES, which will cause any ongoing exercises to cease. This could lead to some confusion, increasing the potential for additional problems and/or accidents. However, the NTC EOC, which has limited emergency power, will be able to provide services for timely repair of the line.

The Coolwater-Tiefort line is inspected three to four times annually. The insulators may require increased maintenance because they are susceptible to dust-related problems. The Coolwater-Tiefort line may be more susceptible to dust than the LADWP transmission lines because they are closer to the ground than the LADWP lines. Because the line runs through areas where maneuvering of tactical vehicles may occur, inspection and maintenance activities will have to be closely coordinated with the NTC EOC. If SCE is not allowed to perform the necessary maintenance, there may be significant impacts resulting from dust buildup on the insulators.

SCE Remote Barstow Transmission Line

The SCE Remote Barstow Transmission line also provides electricity to Fort Irwin and the Goldstone Communications Complex. The transmission poles supporting this line are wooden and spaced 250 to 500 feet apart. All of the potential impacts will be the same for this line as the Coolwater-Tiefort line, but the probability of accidents will be lower because this particular line borders Fort Irwin Road. Maneuvers will not occur in such close proximity to Fort Irwin Road. The Lane Mountain and Velvet Peak lines, which serve the FAA radar and microwave facility and the Contel and LADWP microwave facilities, derive their power from the Remote Barstow Line.

SCE Coyote Lake Ground Electrode Service Line

This line services the LADWP Coyote Lake dc ground electrode. Approximately 3 miles of the Coyote Lake ground electrode line, 1 above ground and 2 buried, are in the Modified Coyote Basin Alternative area.

This line will be susceptible to damage from vehicles hitting the steel poles for the aboveground portion of the line. If a pole is struck, disruption of power to the ground electrode might occur. These poles are much stronger than the wood poles used for the other lines mentioned, but they are susceptible to damage. The underground portion of the line will be less susceptible to damage from vehicles but could still be unearthed due to erosion or frequent crossing by tracked vehicles. There is potential for significant impacts if the aboveground portion of the line is damaged or the underground portion is unearthed. In both cases, disruption of service could occur.

The ground electrode is equipped with emergency backup power. It is considered to be an integral part of the operation of the LADWP dc transmission line. Direct impacts on this transmission line were discussed under the Proposed Action. Because of the importance of the ground electrode, damage to the service line will result in a significant impact.

Maintenance/inspection and emergency repair will require NTC EOC notification and access approval. Inspection/maintenance requirements for the portion of this line inside the Modified Coyote Basin Alternative area are minimal. If SCE is not allowed to conduct regular inspections or maintenance on the line, the impacts have the potential to be significant. Because maintenance requirements are minimal, the NTC EOC will, in most instances, be able to schedule maintenance activities around maneuvers.

SCE Alvord Mountain Service Line

The SCE Alvord Mountain service line provides primary power to the AT&T microwave facility on Alvord Mountain. Because the wooden poles are susceptible to damage from vehicles, the potential for a significant impact is high where the maneuvers will cross the utility line and moderate where maneuvers will be primarily north of the facility. In the event of damage to the line, SCE does have a backup power system to the AT&T microwave facility.

Maintenance/inspection and emergency repair will require NTC EOC notification and access approval. Inspection/maintenance requirements for the portion of this line inside the Modified Coyote Basin Alternative area are minimal, but dust contamination of insulators may require periodic cleaning or replacement. If SCE is not allowed to perform maintenance/inspection or emergency repair, then there may be significant impacts.

LADWP dc Ground Electrode and Microwave Relay Station

The direct current (dc) ground electrode system consists of buried feeder cables, hand holes, and wells. The electrode system is essential to normal continuous operation of the dc system. It also serves as an alternate way of conduction for the entire current load (or a substantial portion thereof) through the earth during certain abnormal or "emergency" system conditions. The components of the electrode system are very susceptible to damage from vehicles driving over them. In addition, a vehicle hitting a steel pole supporting the electrode conductors (outside the electrode conductor circle) could cause collapse of the structure and/or allow the conductor's ground clearance to be reduced to dangerous levels. A vehicle collision with the fencing around the electrode terminal building may occur if visibility is reduced by excessive dust or smoke as a result of maneuvers.

The consequences of losing this system will result in a significant impact.

The microwave system, which is vital to monitoring and running this facility, on top of the control building that communicates with Lane Mountain, will not be impacted by vehicle dust plumes provided that the dust was generated outside the perimeter of the 3,000-foot-diameter ground electrode.

Impacts on emergency repair will be essentially the same as for the transmission lines and are therefore classified as significant. If the conductor, electrode, or microwave system is damaged, LADWP will need immediate access.

LADWP must inspect the ground conductor lines and electrode on a regular basis; however, because of the shorter distances, fewer lines are involved, and the inspection does not take as much time as the transmission lines. Thus, there is more time flexibility to schedule inspection and maintenance activities.

As with the transmission lines, there will be a benefit to having these utilities inside the NTC because vandalism should be decreased.

SCE Service Line to WILLTEL Repeater

The SCE service line provides primary power to WILLTEL'S repeater station located south of Alvord Mountain in Corridor D. Direct impacts on the facility were addressed under the Proposed Action. Because the wooden poles are susceptible to damage from vehicles, a potential significant impact will occur where the maneuvers will cross the utility line and moderate where maneuvers will be primarily north of the facility. The repeater station is an important part of WILLTEL's communications network and thus will result in a significant impact from loss of power to this facility.

Maintenance/inspection and emergency repair will require NTC EOC notification and access approval. Inspection/maintenance requirements for the portion of this line inside the Modified Coyote Basin Alternative area are minimal, but dust contamination of insulators may require periodic cleaning or replacement resulting in a significant impact. The impact on emergency repairs of the service line will not be significant because of emergency backup power at the WILLTEL repeater station.

CONTEL Fiber-Optic Cable

The CONTEL buried fiber-optic telephone cable in the proximity of Fort Irwin Road services Fort Irwin, the Goldstone Communications Complex, and private residences off of Fort Irwin Road. The burial of the line and its proximity to Fort Irwin Road make it less susceptible to damage than aboveground power lines. However, the fiber-optic cables are susceptible to damage from constant vibration that could occur at the vehicle crossing points. With no changes to the cable as presently configured, the potential for physical damage will result in a significant impact.

With the implementation of the Modified Coyote Basin Alternative, CONTEL will lose the customer base associated with the residences off Fort Irwin Road. Because there are relatively few residences, the financial loss to CONTEL is expected to be less than significant.

Because the cable is buried, it does not require regular inspection or maintenance. If emergency repair is necessary, then CONTEL will require access. If CONTEL is not able to access the cable for emergency repairs, then telephone service may be significantly impacted.

Vandalism has not been a problem with this cable, and hence being within the NTC will not necessarily be a benefit.

Montana Mines Microwave Facility

This facility has not been used since September 1990 in part due to equipment obsolescence. Because of its mountaintop location, vehicle traffic and maneuvers will not impact this facility. If the facility is activated again, there may be an impact if inspection and maintenance cannot be conducted on a timely basis. This impact would not be expected to be significant.

WILLTEL Fiber-Optic Cable System Regeneration/ Repeater Station

The fenced regeneration/repeater station is located in Corridor D, between the LADWP utility lines south of Alvord Mountain. Physical damage resulting from collisions of military vehicles with the station may significantly impact service. This station receives its power from an SCE service line. The potential impacts on the SCE service line were previously discussed.

The repeater station requires inspection and maintenance on a weekly basis. If WILLTEL is unable to conduct its regular inspection and maintenance, then there may be a significant impact on the operation of the facility. Similarly, if there is interference with emergency repair resulting from the operation of maneuvers, then there may be significant impacts on the operation of the facility.

AT&T Alvord Mountain Microwave Facility

This facility, which is located within the Modified Coyote Basin Alternative, provides transmission of transcontinental telephone communications. Loss of this facility will result in rerouting phone calls through other facilities. This will result in a significant impact because enough alternate lines may not be available for rerouting calls. The facility's mountaintop location will isolate it from direct impacts of tactical vehicles. However, hovering rotary-winged aircraft, flying within 200 feet of the microwave facility, can impact telephone transmissions by blocking transmission and reception.

The facility is unmanned but is inspected twice a week, and fuel is brought in occasionally for the backup generator. Portable equipment is normally brought in for any repairs that might be required. If inspection and maintenance personnel are unable to access this facility because maneuvers interfere, then the function of this facility may be compromised. Lack of adequate maintenance and inspection of the facility may result in a significant impact.

In the event that emergency repair is necessary, the NTC EOC will grant immediate access upon request. However, because tactical vehicles and/or soldiers may be maneuvering across the access route, the time it takes to move them may impede access and could result in a significant impact.

Vandalism has not been noted as a problem with this facility. Nonetheless, being within the confines of the base could have a slight beneficial impact.

The AT&T microwave facility is relatively at the same low level of risk in all the alternatives from aircraft because it is encompassed in a maneuver area and is quite safe from vehicles because it is located on a peak. However, the SCE service line providing power to this facility is exposed, in the area southwest of Spanish Canyon, to the represented vehicle movement path. As such, the risk to the service line relative to the Alvord Alternative is less because there is a force-on-force engagement area that encompasses the line, but higher than the Superior Alternative, which has no represented force movements or engagement areas encompassing the line. Relative to the Avawatz Alternative, the risk is about the same.

Impacts on Future Utilities Inside the Alternatives

The Mead-Adelanto 500-kV transmission line is currently under construction and will be placed into service before the proposed land acquisition by the NTC. Therefore, construction activities should not be impacted by NTC operations.

4.13.3.2 Mitigation

The Army has committed to implement mitigation measures to avoid significant impacts on existing and future utility corridor uses, subject to availability of funding. The mitigation measures vary in applicability based on the alternative. Those necessary to mitigate the impacts of the Modified Coyote Basin Alternative are provided below and are listed in Table 4.13-3.

Mitigation for Utilities Inside the Modified Coyote Basin Alternative

Los Angeles Department of Water and Power (LADWP)

Planned 500-kV Transmission Line in Corridor Q

Implementation of Mitigation Measures 1 through 6, discussed above for the Proposed Action, will reduce the impacts on the transmission lines in Corridor Q.

LADWP Lane Mountain Facility

10. A night time aircraft warning light will be installed, if not present, as a safety measure to prevent accidental collisions with the tower or facility and to provide a valuable aid in navigation around the facility.

Southern California Edison

Coolwater-Tiefort Subtransmission Line

11. The Coolwater-Tiefort subtransmission line will require relocation. The preferred realignment will be in Corridor Q, south of the intended route for the LADWP 500-kV Mead-Adelanto transmission line, to Fort Irwin Road, and then northward along the road. This will provide a more accessible route for maintenance crews and reduce the probability of having to clean the insulators of dust caused by vehicles. The relocated Coolwater-Tiefort subtransmission line will be constructed to a height that will permit the safe clearance of vehicles under the conductors.

33-kV Remote Barstow Distribution Line

12. The 33-kV Remote Barstow distribution line wood poles will be marked with reflective bands that are visible at night. In open space areas, wood poles that have counterpoise will be replaced with steel poles without counterpoise. Protective barriers will be constructed around the poles located adjacent to vehicle crossings. These

barriers will include concrete or steel bollards, large rocks (1 ton or heavier), or berming.

Relocating the 33-kV Remote Barstow distribution line will not reduce impacts because it is located adjacent to Fort Irwin Road. Tracked vehicle crossings will be restricted to reinforced areas in the road.

Ground Electrode Distribution Line

13. The 16-kV distribution line to the LADWP Coyote Lake ground electrode will be installed underground for the 1.5-mile stretch within the Modified Coyote Basin Alternative. Underground utility vaults that will have to be constructed will be protected by concrete or steel pipe bollards with suitable foundations. The burial depth and/or encasement for the line will provide protection from loading of tracked vehicles. The route of the line will be marked with placards to prevent the military from trenching or "digging in" in this area. It is expected that the line will be buried with the LADWP ground electrodes as mentioned in Mitigation No. 10.

Alvord Mountain Service Line to AT&T

14. The 5-mile section of the Bragdon 12-kV service line south of Corridor D, which supplies power to the AT&T microwave facility on Alvord Mountain, will be relocated to run parallel with Corridor D. The realignment will require lengthening the line to 6 miles within the Modified Coyote Basin Alternative. The line will then have to be relocated down Harvard Road for a 2.5-mile segment south of the southern boundary of this alternative. This will permit the former pole line route to be used for maneuvers for the force-on-force exercises without establishing specific trails. In addition, maintenance and repair of the line will then be accomplished from the Corridor D access road.

15. In areas where the service line power poles are near the service road, reflective bands will be installed for increased night visibility. Poles in flat open areas that have counterpoise shall be replaced with steel poles without counterpoise.

Service Line to Lane Mountain

The service line supplying power to CONTEL and LADWP on Lane Mountain will be protected by implementation of Mitigation Measure No. 2.

Service Line to WILLTEL Repeater

The service line supplying power to the "Midway" repeater station will be protected by implementation of Mitigation Measure No. 2 for the LADWP's transmission lines.

CONTEL Fiber-Optic Cable

16. The portion of the fiber-optic cable inside the proposed Modified Coyote Basin Alternative will be marked with placards indicating its location to prevent accidental excavation and tracked vehicles from driving across it in undesignated areas.

17. Designated areas will be established for tracked vehicle crossings. Underground encasements will be constructed where these crossings intersect the unimproved road so the fiber-optic cable can pass through without being damaged.

18. Vehicle operators will be crossing at designated sections of Fort Irwin Road and will be required to stay at least 100 feet away from the centerline of the fiber-optic cable when traveling off-road.

AT&T Alvord Mountain Microwave Facility

19. An operational restriction will be imposed, limiting the use of tracked military vehicles on the service road in order to prevent degradation. The NTC will maintain the remainder of the road for utility company access to the facility.

4.13.4 Alvord Alternative

4.13.4.1 Impacts

The utilities previously mentioned in the Modified Coyote Basin Alternative (Section 4.13.3) are also encompassed within the Alvord Alternative with the exception of the CONTEL fiber-optic cable and the SCE Coolwater-Tiefort and Barstow Remote lines.

The Coyote Lake ground electrode located near the westerly extreme of this alternative will not be impacted by maneuvers.

This alternative will have the greatest potential to affect utilities in Corridor D (i.e., LADWP transmission lines, WILLTEL fiber-optic cable, and Kern River pipeline) because maneuver areas span both sides of the utility corridor. The movement of tactical vehicles along both the north and south sides of Corridor D may occur along the corridor for a distance of about 66 miles, and traversing the corridor will require multiple crossing points.

In addition to the above-mentioned utilities, the utilities described below are encompassed by this alternative.

AT&T Alvord Mountain Microwave Facility

The AT&T microwave facility is at the same relatively low level of risk as discussed for the Modified Coyote Basin Alternative. However, the SCE Alvord Mountain service line that provides power to this facility may be impacted by force-on-force maneuvers in the area southwest of Spanish Canyon.

SCE Velvet Peak Service Line

The SCE Velvet Peak service line carried on wooden poles provides service to the FAA radar/microwave facility at Velvet Peak. Damage to this line will disrupt primary power to this facility. Direct impacts on this facility are discussed below. The radar/ microwave facility has an emergency generator for backup. Because the line is in hilly terrain offset from a service road, the likelihood of tactical vehicles maneuvering near the lines and striking a pole is low. The associated impact of damage to the line will be significant.

The NTC EOC notification will be required for access to conduct routine maintenance/inspection and emergency repairs of the line. Therefore, impact is classified as low. There will be a moderate impact if cleaning the insulators due to vehicle-generated dust is required or if, in lieu of this, new or additional insulators are installed.

FAA Velvet Peak Radar and Microwave Facility

This facility serves as a gap filler of radar for Edwards AFB's main radar system. It serves both civilian and military aircraft, including space shuttle surveillance. The loss of this radar will result in a significant impact.

The facility is located on a peak in a fenced compound. Thus, the potential for damage from a vehicle will be very low. The probability that the facility could be hit by low-flying aircraft is also considered to be low. The potential impact on the SCE service line providing power for the facility was previously addressed.

The facility is inspected on a weekly basis. The impact on inspection/maintenance under the NTC EOC notification and access approval procedures will not be significant. Impacts on emergency repair will be classified as less than significant for the same reason.

Vandalism has not been noted as a problem with this facility; however, it has been noted as a general problem with access roads and power service lines. Thus, being within the confines of the base could have a beneficial impact.

4.13.4.2 Mitigation

The Army has committed to implement the following mitigation measures in addition to the previously listed mitigation measures to avoid significant adverse impacts on existing and future utility corridor uses, subject to availability of funding. The mitigation measures vary in applicability based on the alternative and are provided below. Table 4.13-3 lists the recommended mitigation measures for each alternative, which includes utilities inside and adjacent to the NTC expansion. Additional mitigation measures specific to the Alvord Alternative have been included.

The service line supplying power to the FAA radar at Velvet Peak shall be protected by implementation of Mitigation Measure No. 2.

Mitigation Measures Nos. 11 and 19 shall be implemented for the FAA Velvet Peak radar and microwave facility.

4.13.5 Superior Valley Alternative

4.13.5.1 Impacts

The Superior Valley Alternative will encompass most of the utilities previously discussed with the exception of those located south of Corridor D. Because the potential maneuver areas in this alternative are located at least ½ mile to the north of the transmission towers in Corridor D, for a reach of about 63 miles, the overall potential to affect the existing utilities (i.e., LADWP transmission lines, WILLTEL fiber-optic cable, and Kern River Pipeline) is less than that in the Proposed Action, Modified Coyote Basin, and Alvord Alternatives.

The AT&T microwave facility is relatively at the same low level of risk in all the alternatives (except the Proposed Action) from aircraft because it is located on a peak. Relative to all the other alternatives, the exposure to the service line is the least after the Proposed Action. It should be noted that this facility maintains backup power.

Relative to the Proposed Action and the Modified Coyote Basin Alternative, the risk to the Coyote ground electrode system and the associated SCE power source from the Superior Valley Alternative will be greater. The risk to the electrode and power source will be greater from the Superior Valley Alternative because potential maneuver corridors may traverse the SCE power source and skirt the southern side of the electrode field.

Risks to the Coolwater-Tiefort and Barstow Remote lines will be greater for the Superior Valley Alternative than for the Proposed Action, which does not extend into these areas, and less than for the Modified Coyote Basin Alternative because potential force-on-force engagement areas could be located in the vicinity of these utilities.

The CONTEL fiber-optic cable has approximately the same amount of length as the Barstow Remote line in this alternative; however, because this line is buried, its exposure is minimal and as such the risk to it is much less relative to the power line.

Although Corridor Q is in this alternative, the planned 500-kV transmission line would not be included in maneuver areas, which would be located to the north.

In addition to the above-mentioned utilities, the utilities described below are encompassed by this alternative.

LADWP Lane Mountain Microwave Facility

The microwave facility location on top of Lane Mountain precludes it from possibly being impacted by vehicles. In addition, it is located in an area where Army air support is presently excluded. Thus, the highest potential damage is to the power line.

The facility is equipped with backup power; hence, the facility could continue to operate even if the service line was damaged. A significant impact will occur if the microwave facility were damaged to the extent that it became inoperative. Because of the importance of this system for the operation of the dc ground electrode, it will need to be repaired immediately if it is damaged.

Because the maintenance personnel will schedule their inspection by calling the NTC EOC, there should not be any impacts on maintenance. For emergency repairs, the NTC EOC upon notification will allow immediate access resulting in a less than significant impact.

Although there has been little damage to the facility itself from vandals, the service roads and power lines have been damaged. The potential for such damage will be decreased for the on-post alternatives.

CONTEL Lane Mountain Microwave Facility

This facility is located on Lane Mountain as is the LADWP microwave facility. Thus, the potential impacts will be the same as those for the LADWP facility previously described. An SCE service line provides power for this facility. Potential impacts on this line were previously described.

4.13.5.2 Mitigation

The Army has committed to implementing the previously listed mitigation measures to avoid significant impacts on existing and future utility corridor uses, subject to availability of funding. The mitigation measures vary in applicability based on the alternative and are provided below. Table 4.13-3 lists the recommended mitigation measures for each alternative, which includes utilities inside and adjacent to the NTC expansion. Only mitigation measures specific to the Superior Valley Alternative will be implemented for this alternative.

4.13.6 Avawatz Alternative

4.13.6.1 Impacts

Like the Superior Valley Alternative, the Avawatz Alternative does not include Corridor D, so those utilities located within the corridor will not be directly affected by implementation of this alternative.

The Avawatz Alternative encompasses most of the utilities previously discussed except for the LADWP and CONTEL microwave facilities on Lane Mountain, the SCE service line to Lane Mountain, the FAA radar at Velvet Peak, and the SCE service line to Velvet Peak.

The AT&T microwave facility is relatively at the same low level of risk in all the alternatives because it is located on a peak. This facility maintains backup power.

The potential for the Avawatz Alternative to affect the utilities in Corridor D may be potentially caused by vehicles straying from the maneuver area located approximately ½ mile north of the corridor. The utilities within Corridor D include LADWP transmission lines, WILLTEL fiber-optic cable, and the Kern River pipeline. Approximately 68 miles of Corridor D border this alternative. This risk will be lower relative to the Proposed Action, Modified Coyote Basin, and Alvord Alternatives, which have maneuver areas encompassing the Corridor D utilities for almost their entire lengths through the expansion area.

The Avawatz Alternative will have the same potential impacts on the ground electrode system as the Superior Valley Alternative because vehicles involved in maneuvers may traverse the Coyote ground electrode conductor pole line and SCE power source, while skirting to the south of the electrode field.

The potential impact of the Avawatz Alternative to the Coolwater-Tiefort and the Barstow Remote lines relative to the Superior Valley Alternative is about the same because both will potentially have maneuver areas located around these utilities.

The CONTEL fiber-optic cable has approximately the same amount of length as the Remote Barstow line in this alternative; however, because this line is buried, its exposure is minimal and as such the risk to it is much less relative to the power line.

The Avawatz Alternative will have the same probability for impacts on Corridor Q as the other alternatives.

4.13.6.2 Mitigation

The Army has committed to implementing the previously listed mitigation measures to avoid significant impacts on existing and future utility corridor uses, subject to availability of funding. The mitigation measures vary in applicability based on the alternative and are provided below. Table 4.13-3 lists the recommended mitigation measures for each alternative, which includes utilities inside and adjacent to the NTC expansion. The reader is referred to previous sections for descriptions of the mitigations.

4.13.7 No Action Alternative

With the No Action Alternative, military exercises and equipment support will be limited to existing levels and restricted within the existing boundaries of Fort Irwin. Therefore, there will be no increased impact on utilities with the No Action Alternative. Present and future uses of the utilities will continue subject to BLM review and permit authorization.

4.13.8 Cumulative Impact

The cumulative projects may contribute to an increase in the potential for damage or disruption of utility service. The mitigation described in Section 4.13.1.2 will reduce the Proposed Action's contribution to this impact to insignificant.

4.13.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.13-2. Table 4.13-3 lists the recommended mitigation measures for each alternative, which includes utilities inside and adjacent to the NTC expansions. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.13-4.

Table 4.13-2

UTILITIES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Utility	Proposed Action	Modified Avawatz-Silurian Alternative	Modified Coyote Basin Alternative	Alvord Alternative	Superior Valley Alternative	Avawatz Alternative
AT&T Microwave Facility	No impacts from aircraft if kept 300 feet away.	No impacts from aircraft if kept 300 feet away.	No impacts from aircraft if kept 300 feet away.	No impacts from aircraft if kept 300 feet away.	No impacts from aircraft if kept 300 feet away.	No impacts from aircraft if kept 300 feet away.
CONTEL & LADWP Microwave at Lane Mountain	These utilities are not in this alternative; no impacts.	These utilities are not in this alternative; no impacts.	These utilities are not in this alternative; no impacts.	These utilities are not in this alternative; no impacts.	No transmission impact from aircraft if kept 300 feet away. Impacts on electrical service line from vehicle damage.	No transmission impact from aircraft if kept 300 feet away. Impacts on electrical service line from vehicle damage.
FAA Radar at Velvet Peak	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	No direct impact, but electrical service line can be damaged by vehicle.	No direct impact, but electrical service line can be damaged by vehicle.
CONTEL Fiber-Optic Cable	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	Reduced customer base. Impacts from vibration and cyclical loading.	This utility is not in this alternative; no impacts.	Reduced customer base. Impacts from vibration and cyclical loading.	Reduced customer base. Impacts from vibration and cyclical loading.
WILLTEL Fiber-Optic Cable and Repeater in Corridor D	Impacts from vibration, cyclical loading, and erosion of groundcover over cable.	Impacts from vibration and cyclical loading at two specific crossing points.	Impacts from vibration and cyclical loading.	Impacts from vibration and cyclical loading.	Impacts from vibration and cyclical loading.	Impacts from vibration and cyclical loading.
Kern River Pipeline in Corridor D	Impacts from vehicle damage to block valve and erosion of pipe cover.	Impacts from vehicle damage to block valve and erosion of pipe cover at two specific crossing points.	Impacts from vehicle damage to block valve and erosion of pipe cover.	Impacts from vehicle damage to block valve and erosion of pipe cover.	Impacts from vehicle damage to block valve and erosion of pipe cover.	Impacts from vehicle damage to block valve and erosion of pipe cover.
LADWP Transmission Lines in Corridor D	Impacts on towers from vehicle collisions. Possible impacts on insulators from increased dust. Impacts on maintenance and inspection.	Impacts on towers from vehicle collisions. Possible impacts on insulators from increased dust. Impacts on maintenance and inspection. Impacts localized at two specific crossing points.	Impacts on towers from vehicle collisions. Possible impacts on insulators from increased dust. Impacts on maintenance and inspection.	Impacts on towers from vehicle collisions. Possible impacts on insulators from increased dust. Impacts on maintenance and inspection.	Impacts on towers from vehicle collisions. Possible impacts on insulators from increased dust. Impacts on maintenance and inspection.	Impacts on towers from vehicle collisions. Possible impacts on insulators from increased dust. Impacts on maintenance and inspection.

Table 4.13-2

UTILITIES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Utility	Proposed Action	Modified Avawatz-Silurian Alternative	Modified Coyote Basin Alternative	Alvord Alternative	Superior Valley Alternative	Avawatz Alternative
dc Ground Electrode	No impacts. This line does not occur within this alternative.	No impacts. This line does not occur within this alternative.	Impacts on underground electrode field from vehicle weight. Impacts on conductor pole line from vehicle collisions. Impacts on underground conductors from excavation. Impacts on underground utility vaults from vehicle loads. Impacts on microwave equipment from excessive vehicle dust.	Impacts on underground electrode field from vehicle weight. Impacts on conductor pole line from vehicle collisions. Impacts on underground conductors from excavation. Impacts on underground utility vaults from vehicle loads. Impacts on microwave equipment from excessive vehicle dust.	Impacts on underground electrode field from vehicle weight. Impacts on conductor pole line from vehicle collisions. Impacts on underground conductors from excavation. Impacts on underground utility vaults from vehicle loads. Impacts on microwave equipment from excessive vehicle dust.	Impacts on underground electrode field from vehicle weight. Impacts on conductor pole line from vehicle collisions. Impacts on underground conductors from excavation. Impacts on underground utility vaults from vehicle loads. Impacts on microwave equipment from excessive vehicle dust.
SCE Coolwater-Tiefort Line	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	Impacts on wooden poles from vehicle collisions. Impacts on insulators from excessive dust. Impacts from electrical shorting due to inadequate clearance. Impact to maintenance and inspection.	Impacts on wooden poles from vehicle collisions. Impacts on insulators from excessive dust. Impacts from electrical shorting due to inadequate clearance. Impact to maintenance and inspection.	Impacts on wooden poles from vehicle collisions. Impacts on insulators from excessive dust. Impacts from electrical shorting due to inadequate clearance. Impact to maintenance and inspection.	Impacts on wooden poles from vehicle collisions. Impacts on insulators from excessive dust. Impacts from electrical shorting due to inadequate clearance. Impact to maintenance and inspection.
SCE Remote Barstow Lines	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	Impacts on wooden poles from vehicle collisions. Possible impacts on insulators from excessive dust.	Utility not in this alternative; no impacts.	Impacts on wooden poles from vehicle collisions. Possible impacts on insulators from excessive dust.	Impacts on wooden poles from vehicle collisions. Possible impacts on insulators from excessive dust.
Future LADWP 500-kV Transmission Line in Corridor Q	New line not in this alternative; no impacts.	New line not in this alternative;no impacts.	Construction of new line not impacted. After construction, completed line may have the same impacts as for the LADWP lines in Corridor D.	Construction of new line not impacted. After construction, completed line may have the same impacts as for the LADWP lines in Corridor D.	Construction of new line not impacted. After construction, completed line may have the same impacts as for the LADWP lines in Corridor D.	Construction of new line not impacted. After construction, completed line may have the same impacts as for the LADWP lines in Corridor D.
US Sprint Fiber-Optic Cable	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.
AT&T Fiber-Optic Cable	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.	This utility is not in this alternative; no impacts.

Table 4.13-3

UTILITIES - SUMMARY OF MITIGATIONS

Utility	Proposed Action	Modified Avawatz-Silurian	Modified Coyote Basin Alternative	Alvord Mountain Alternative	Superior Valley Alternative	Avawatz Alternative
AT&T Microwave Facility at Alvord Mountain	No Impacts/No Mitigations	No Impacts/No Mitigations	1, 7, and 19	1, 7, and 19	1, 7, and 19	1, 7, and 19
CONTEL Fiber-Optic Cable	No Impacts/No Mitigations	No Impacts/No Mitigations	1	No Impacts/No Mitigations	1, 17, 18, and 19	1, 17, 18, and 19
CONTEL Microwave at Lane Mountain	No Impacts/No Mitigations	No Impacts/No Mitigations	No Impacts/No Mitigations	No Impacts/No Mitigations	1, 7, and 10	No Impacts/No Mitigations
CONTEL Microwave at Montana Mines	No Impacts/No Mitigations	No Impacts/No Mitigations	1, 12, and 10	1, 7, and 10	1, 7, and 10	1, 7, and 10
FAA Radar/Microwave at Velvet Peak	No Impacts/No Mitigations	No Impacts/No Mitigations	1, 12, and 10	1, 7, and 10	1, 7, and 10	1, 7, and 10
Kern River Natural Gas Pipeline in Corridor D	1, 2, 3, 8, and 9	1, 2, 3, 8, and 9	1, 2, 3, 8, and 9	1, 2, 3, 8, and 9	1, 2, 3, 8, and 9	1, 2, 3, 8, and 9
LADWP Transmission Lines in Corridor D	1 through 6	1 through 6	1 through 6	1 through 6	1 through 6	1 through 6
LADWP Microwave at Lane Mountain	No Impacts/No Mitigations	No Impacts/No Mitigations	1 and 10	1 and 10	1 and 10	No Impacts/No Mitigations
LADWP Coyote Lake Ground Electrode and Microwave	1	1	1	1	1	1
SCE 16-kV Distribution Line to Ground Electrode	No Impacts/No Mitigations	No Impacts/No Mitigations	1 and 14	1 and 14	1 and 14	1 and 14
SCE Remote Barstow 33-kV Distribution Line	No Impacts/No Mitigations	No Impacts/No Mitigations	1 and 13	No Impacts/No Mitigations	1 and 13	1 and 13
SCE Coolwater-Tiefort Subtransmission Line	No Impacts/No Mitigations	No Impacts/No Mitigations	11	No Impacts/No Mitigations	1 and 8	1, 7, and 10
SCE Velvet Peak Service Line	No Impacts/No Mitigations	No Impacts/No Mitigations	No Impacts/No Mitigations	No Impacts/No Mitigations	1	1, 7, and 10
SCE Lane Mountain Service Line	No Impacts/No Mitigations	No Impacts/No Mitigations	1 and 2	No Impacts/No Mitigations	1 and 2	1, 2, 3, 12, and 13
SCE Alvord Mountain Service Line	No Impacts/No Mitigations	No Impacts/No Mitigations	1, 15, and 16	1, 15, and 16	1, 15, and 16	1 through 6
SCE Service Line to WILLTEL Repeater	No Impacts/No Mitigations	No Impacts/No Mitigations	1 and 2	1 and 2	1 and 2	1 and 7
WILLTEL Fiber-Optic Cable	1, 2, 3, and 7	1, 2, 3, and 7	1, 2, 3, and 7	1, 2, 3, and 7	1, 2, 3, and 11	1, 2, and 7

Table 4.13-4

UTILITIES - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
AT&T Microwave Facility	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to not significant.	Impacts reduced to not significant.	Impacts reduced to not significant.	Impacts reduced to not significant.
CONTEL & LADWP Microwave at Lane Mountain	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to not significant.	Impacts reduced to not significant.
FAA Radar at Velvet Peak	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
CONTEL Fiber-Optic Cable	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
WILLTEL Fiber-Optic Cable and Repeater in Corridor D	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
Kern River Pipeline in Corridor D	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.

Table 4.13-4

UTILITIES - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
Kern River Pipeline in Corridor D	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
LADWP Transmission Lines in Corridor D	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
dc Ground Electrode	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
SCE Coolwater-Tiefort Line	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
SCE Remote Barstow Lines	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	Impacts reduced to less than significant.
Future LADWP 550-kV Transmission Line in Corridor Q	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.	Impacts reduced to less than significant.

Table 4.13-4

UTILITIES - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	Modified Avawatz-Silurian	Modified Coyote Basin	Alvord	Superior Valley	Avawatz
U.S. Spring Fiber-Optic Cable	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
AT&T Fiber-Optic Cable	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.

4.14 TRANSPORTATION AND ACCESS

The following discussion summarizes the impacts on the public and military transportation system in the study area encompassing the proposed expansion alternatives. A significant impact on the transportation/circulation system was defined as a decrease in the level of service of the existing transportation network.

4.14.1 Proposed Action

4.14.1.1 Impacts

National and State Road System

No increases in personnel and equipment are proposed for the Proposed Action or any of the other alternatives. Potential impacts on the regional transportation system may occur to I-15 and State Highway 127. I-15 is a four-lane highway and is used to transfer military personnel arriving at Edwards AFB, Nellis AFB, or the former George AFB, by bus, to the NTC. However, buses travel during off-peak traffic periods; the soldiers currently arrive at former George AFB between 10:00 p.m. and 4:00 a.m. The 28-day training cycle allows for 3 days of arrival and transfer of soldiers into Fort Irwin and 3 days to transfer the soldiers back to former George AFB. In other words, these bus trips will typically occur over 3 days during off-peak periods and therefore will have a negligible impact on I-15.

Trucks transport heavy equipment supplies from the Marine Corps's Yermo Annex rail site in Barstow to the NTC. I-15 is currently operating at less than half capacity, and these truck trips have a negligible impact on I-15. In addition, the equipment is sometimes off-loaded at the Manix railhead and self-deployed to the NTC via the existing tank trail, in which case there will be no impact on I-15.

The Proposed Action includes the area south of the utility corridor, which could become a source area for dust generation and sand transport across State Highway 127 during periods of high winds. Soil disturbance by OHVs and associated vertical mixing will lead to dust clouds that extend hundreds of feet into the air over the activity. The concern is especially strong just west of the Cronese Lakes where wind funneling through a number of gaps in the Cronese Mountains may create wind jetting and intensify the dust cloud formation and sand transport. The dust clouds can potentially decrease visibility on the highways and will be a distraction to motorists on I-15 and State Highway 127 even if seen from a distance, resulting in traffic slowing and affecting the operation and level of service of the highway. This will result in a significant impact.

Six tank undercrossings have been proposed to be constructed across State Highway 127 to facilitate Army vehicle and equipment movement across the highway. Construction of the crossings may result in traffic delays. However, it should not be necessary to close all lanes of State Highway 127 at the same time. This decrease in the level of service will result in a less than significant impact.

When the undercrossings are complete, Army vehicles will be able to cross State Highway 127 without interrupting normal traffic operation.

Soldier movements visible from State Highway 127 may be a distraction to motorists and result in traffic slowing. However, because this will not result in lane closure or traffic stopping, this will result in a less than significant impact.

Secondary, County, and Local Roads

No impacts on Fort Irwin Road, the only route extending from Barstow into the NTC, are expected with the Proposed Action. Bus trips to transport soldiers typically occur over a 3-day period between 10:00 p.m. and 4:00 a.m. During this off-peak period, the road is used regularly by other commuters. Because there will be no increase in the number of bus trips over the existing level, there will be no impact on Fort Irwin Road as a result of the Proposed Action.

The trucks used to transport heavy equipment supplies currently access the Fort Irwin Military Reservation via Fort Irwin Road. These truck trips are necessary only twice per rotation (occurring approximately once a month). However, these trips can occur even less often because equipment is sometimes offloaded at the Manix railhead. Therefore, due to the infrequency of occurrence, Fort Irwin Road is not expected to be impacted by additional truck traffic.

The tank trail extending from the Manix railhead into Fort Irwin Military Reservation is used solely to transfer heavy support equipment and is expected to continue operating at the existing level.

Implementation of the Proposed Action will restrict access to Silver Lake Road, Saratoga Springs Road, Old Railroad Road, and several dirt roads that branch off Saratoga Springs Road. Restricted access to these roads will not be significant because of the low level of current use by the public.

Railroads

Combat vehicles used in training arrive by rail and are principally unloaded at the Marine Corps's Yermo Annex in Barstow or the Manix railhead. Under the Proposed Action, no additional railcars will be needed to transport the wheeled and tracked vehicles into and out of the NTC. Thus, there will be no impacts on the railroad system resulting from implementation of the Proposed Action.

4.14.1.2 Mitigation

1. The NTC shall implement dust control measures including the use of snow fencing, vegetation, and safety hazard signs.

4.14.2 Modified Avawatz-Silurian Alternative

4.14.2.1 Impacts

National and State Road System

This alternative maintains a suitable buffer south of the utility corridor; therefore, no visibility impacts due to dust formation are expected along I-15. Impacts on State Highway 127 will be the same as those discussed for the Proposed Action (Section 4.14.1.1).

Secondary, County, and Local Roads

Impacts will be the same as those discussed for the Proposed Action (Section 4.14.1.1).

Railroads

Impacts will be the same as those discussed for the Proposed Action (Section 4.14.1.1).

4.14.2.2 Mitigation

The mitigation will be the same as that described for the Proposed Action (Section 4.14.1.2).

4.14.3 Modified Coyote Basin Alternative

4.14.3.1 Impacts

National and State Road System

This alternative does not encompass and will not impact State Highway 127. Visibility impacts due to dust formation are expected along I-15. As discussed under the Proposed Action (Section 4.14.1.1), impairment of visibility along I-15 would be considered a significant impact.

Secondary, County, and Local Roads

This alternative will impact the dirt access roads to Alvord Mountain and Coyote Dry Lake. Restricted access to Alvord and Coyote Lake dirt roads will not be significant because of their current low level of civilian use.

Temporary closure of Fort Irwin Road and other designated routes during military training exercises will be necessary to allow for tank crossings. Tanks will cross at controlled crossings, and all road traffic will be temporarily halted. Fort Irwin Road is used by NASA employees to access and egress the Goldstone Deep Space Network. The closure of this road may temporarily impact NASA employees. However, existing road closures during military exercises typically last approximately 30 minutes and are conducted during off-peak travel periods. Implementation of the Proposed Action is expected to result in road closures during off-peak travel periods that may last approximately 1 hour. Due to the temporary nature and off-peak timing of these closures, the impact on motorists using Fort Irwin Road is expected to be at a level that is less than significant.

Railroads

Impacts on the railroad are the same as those described under the Proposed Action (Section 4.14.1.1).

4.14.3.2 Mitigation

The mitigation will be the same as that described for the Proposed Action (Section 4.14.1.2).

4.14.4 Alvord Alternative

4.14.4.1 Impacts

National and State Road System

Impacts are expected to be the same as those described for the Modified Coyote Basin Alternative (Section 4.14.3.1).

Secondary, County, and Local Roads

Impacts to Alvord Road and the dirt access road to Spanish Canyon will be be the same as those described for the Modified Coyote Basin Alternative (Section 4.14.3.1). Fort Irwin Road will not be impacted by the Alvord Alternative.

Railroads

Impacts on the railroad are the same as those listed under the Proposed Action (Section 4.14.1.1).

4.14.4.2 Mitigation

The mitigation will be the same as those described for the Proposed Action (Section 4.14.1.2).

No significant impacts have been identified so mitigation measures are not required.

4.14.5 Superior Valley Alternative

4.14.5.1 Impacts

National and State Road System

This alternative maintains a suitable buffer south of the utility corridor; therefore, no visibility impacts due to dust formation are expected along I-15.

Secondary, County, and Local Roads

In addition to those impacts listed for the Modified Coyote Basin Alternative, some public access roads into the Lane Mountain, Superior Dry Lakes, and Western Mojave Desert areas will be restricted during periods when the NTC is conducting training exercises. Military personnel (Air Force and Navy) and public access into the Superior Valley Range and to areas currently serviced by Copper City Mine Road will be eliminated under the Superior Valley Alternative. This impact will be significant.

Railroads

Impacts on the railroad are the same as those listed under the Proposed Action (Section 4.14.1.1).

4.14.5.2 Mitigation

The mitigation measure below shall be implemented, subject to availability of funding.

2. The NTC shall acquire the necessary rights-of-way and upgrade Murphy's Well Road from an unimproved surface to a two-lane graded road suitable for transfer to the San Bernardino County road maintenance system.

4.14.6 Avawatz Alternative

4.14.6.1 Impacts

National and State Road System

Impacts will be the same as those listed for the Superior Valley Alternative (Section 4.14.5.1).

Secondary, County, and Local Roads

Impacts will be the same as those listed for the Modified Coyote Basin Alternative (Section 4.14.3.1).

Railroads

Impacts on the railroad are the same as those listed under the Proposed Action (Section 4.14.1.1).

4.14.6.2 Mitigation

No mitigations are necessary.

4.14.7 No Action Alternative

4.14.7.1 Impacts

The number of vehicles used for training and transporting military personnel will not increase. Because little growth is anticipated within this portion of the county, existing rates of travel are expected to continue. Existing conditions will continue, and no impacts are expected with the No Action Alternative.

No changes are foreseen in the management of public lands within the expansion area that will restrict access to existing designated routes. The route designation process is ongoing, however, and it is possible that some change in the designation of routes may occur in the future.

4.14.7.2 Mitigation

No mitigations are necessary.

4.14.8 Cumulative Impacts

The cumulative projects may contribute to an increase in traffic, primarily from the Barstow area on the I-40. The Proposed Action will not increase existing the soldier transportation on I-15 and therefore will not contribute to any cumulative traffic increase.

4.14.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.14-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.14-2.

Table 4.14-1

TRANSPORTATION - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Significant impact on Highway 127 and I-15 due to dust generation. Restricted access to Silver Lake Road, Saratoga Springs Road, and Old Railroad Road.	Significant impact on Highway 127 due to dust generation. Restricted access to Silver Lake Road, Saratoga Springs Road, and Old Railroad Road.	Significant impact on I-15 due to dust generation. Restricted access to Alvord Mountain and Coyote Lake Road.	Significant impact on I-15 due to dust generation. Restricted access to Alvord Mountain and Coyote Lake Road.	Significant impact from restriction of access to Copper City Mine Road and Superior Lake. Restricted access to Alvord Mountain and Coyote Lake Road.	No significant impact. Restricted access to Alvord Mountain and Coyote Lake Road.	No impact.

Table 4.14-2

TRANSPORTATION - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Impact on Highway 127 and I-15 due to dust generation reduced to less than significant.	Impact on Highway 127 due to dust generation reduced to less than significant.	Impact on I-15 due to dust generation reduced to less than significant.	Impact on I-15 due to dust generation reduced to less than significant.	Impact to access to Copper City Mine Road reduced to less than significant.	No significant impacts are expected. No mitigation is required.

4.15 SOCIOECONOMICS

4.15.1 Proposed Action

4.15.1.1 Impacts

The proposed land acquisition by the NTC is intended to expand the land area of the installation only. The area is designed to be used for field maneuvers and will not be used for additional permanent structures or military housing. The permanent and temporary population of Fort Irwin will not increase. Therefore, there will be no impacts on the social or economic characteristics of Fort Irwin. Furthermore, the soldiers included in the rotations will not be given access off of the installation. This precludes any social or economic impacts on Barstow or the nearby communities. The acquisition of private land will result in these parcels being removed from the tax base. Because the amount of private land involved is small (5,148 acres), this impact is not expected to be significant (approximately $17,400). There are no anticipated impacts on social or economic resources at Fort Irwin or Barstow resulting from the proposed land acquisition.

The City of Baker is located at the junction of Highway 127 and I-15. With the construction of pull-offs on Highway 127 so travelers can view military maneuvers, it is anticipated that this will favorably affect the economy of Baker. As the chance to view a rare event (military exercises) becomes real, this will increase the traffic through Baker and provide a stimulus to its tourist industries of restaurants, gasoline stations, and motels.

4.15.1.2 Mitigation

No mitigations are necessary.

4.15.2 Modified Avawatz-Silurian Alternative

4.15.2.1 Impacts

Impacts will generally be the same as those described under the Proposed Action (Section 4.15.1.1). The acquisition of private lands (4,380 acres) will result in a loss of approximately $14,800 from property tax revenue.

4.15.2.2 Mitigation

No mitigations are necessary.

4.15.3 Modified Coyote Basin Alternative

4.15.3.1 Impacts

Impacts will be the same as those described under the Proposed Action (Section 4.15.1.1), except for the opportunity to view military exercises on Highway 127. The acquisition of private lands (57,811 acres) will result in a loss of approximately $214,200 from property tax revenue.

4.15.3.2 Mitigation

No mitigations are necessary.

4.15.4 Alvord Alternative

4.15.4.1 Impacts

Impacts will be the same as those described under the Modified Coyote Basin Alternative (Section 4.15.3.1). The acquisition of private lands (37,300 acres) will result in a loss of approximately $134,900 from property tax revenue.

4.15.4.2 Mitigation

No mitigations are necessary.

4.15.5 Superior Valley Alternative

4.15.5.1 Impacts

Impacts will be the same as those described under the Modified Coyote Basin Alternative (Section 4.15.3.1). The acquisition of private lands (79,300 acres) will result in a loss of approximately $286,800 from property tax revenue.

4.15.5.2 Mitigation

No mitigations are necessary.

4.15.6 Avawatz Alternative

4.15.6.1 Impacts

Impacts will be the same as those described under the Modified Coyote Basin Alternative (Section 4.15.3.1). The acquisition of private lands (45,900 acres) will result in a loss of approximately $173,900 from property tax revenue.

4.15.6.2 Mitigation

No mitigations are necessary.

4.15.7 No Action Alternative

The activities presently occurring at the Army's NTC will continue. Battalion-level maneuvers will continue as they currently are. Thus, under the No Action Alternative, no change will result in the socioeconomics other than those associated with potential civilian and military personnel increases at the NTC in the future. In this case, a separate environmental analysis will address the social and economic impacts.

4.15.8 Cumulative Impacts

The cumulative projects would result in an increase in employment for construction and operations personnel.

Most of these employees should come from the Barstow/Newberry Springs area. The Hidden Valley Resources, Rail Cycle, and Broadwell projects would involve the greatest amount of employment opportunity. As expansion projects, neither the Proposed Action nor the Hector Mine Project is expected to increase employment opportunities. Most of the construction and operations personnel for the LLRW facility would probably come from Needles or have relocated to Needles.

A potential shortage of locally available personnel could exist if all the cumulative projects began construction and subsequent operations in the same timeframe. Such a shortage would be influenced by a number of factors, including the amount of personnel hired from the Barstow/Newberry Springs area. A small number of personnel may temporarily or permanently relocate to this area. The Barstow region could readily accommodate demands for housing and services associated with this slight increase in population. This slight increase would also have a positive impact on local economics through purchases of goods and services. The mineral and waste management cumulative projects would contribute to the local and County economy through the tax base, resulting in a beneficial economic impact.

4.15.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.15-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.15-2.

Table 4.15-1

SOCIOECONOMICS - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No impact.
Loss of $17,400 from county property tax revenues.	Loss of $14,800 from county property tax revenues.	Loss of $214,200 from county property tax revenues.	Loss of $143,900 from county property tax revenues.	Loss of $286,800 from county property tax revenues.	Loss of $173,900 from county property tax revenues.	No impact.

Table 4.15-2

SOCIOECONOMICS - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.

4.16 EDUCATION AND RESEARCH

A significant impact on education and research opportunities will occur if either a loss of opportunity to study a cultural or physical resource occurs or an existing long-term study is interrupted.

4.16.1 Proposed Action

4.16.1.1 Impacts

Education and research interests within the study area are well dispersed and will be affected under the Proposed Action. Military operations conducted in the Avawatz Mountains and the Silurian Hills will preclude the existing educational uses at Sheep Creek Springs and the Silurian Hills Geologic Study Area. This alternative will also affect the areas of the Soda Mountains and West Cronese Basin, which are used for education and research. The degradation of these areas by military use is considered a significant impact. However, some areas will be preserved under this alternative, and access to these areas for educational purposes could continue on a restricted schedule, depending on the schedule for maneuvers. Research areas could also be available under restricted circumstances where the Army will limit the periods of time that specific areas of the NTC will be open for visitation and research purposes. In addition, other areas within the CDCA offer similar features and could be used by researchers.

Scheduling conflicts may result if educational field courses must take place during specific dates, such as Easter recess, that coincide with rotational maneuvers. In these situations, educational visits to the area will be precluded. The primary access roads within the study area will be maintained by the NTC. When available for access, educators, students, and researchers will continue to use the area. The restrictions to access and disturbances to natural resources present will reduce the effectiveness of the expansion area for most types of education and research. However, an ideal study area for measuring the impacts of military maneuvers on desert soils will become available.

Insufficient information is available to determine whether long-term study opportunities will be curtailed by the expansion of the NTC under this alternative. If natural resources under study are disturbed or destroyed, or the access constraints result in an inability to continue research, a significant impact will occur.

4.16.1.2 Mitigation

The following mitigation measure(s) shall be implemented, subject to availability of funding:

1. A public access policy will be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area, as is presently done on the existing NTC. Access will also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, off-road vehicles, etc.

2. The Army shall develop a cooperative agreement with the California State University System/Desert Studies Consortium to arrange access to and use of the existing research facility at Sheep Creek Springs.

4.16.2 Modified Avawatz-Silurian Alternative

4.16.2.1 Impacts

Impacts will be similar to those described under the Proposed Action (Section 4.16.1.1); however, 4 square miles of the Silurian Hills will not be impacted under this alternative.

4.16.2.2 Mitigation

Mitigation measures for the Modified Avawatz-Silurian Alternative are the same as those described for the Proposed Action (Section 4.16.1.2).

4.16.3 Modified Coyote Basin Alternative

4.16.3.1 Impacts

The Modified Coyote Basin Alternative will affect the areas of Alvord Mountain, Spanish Canyon, the Soda Mountains, and the West Cronese Basin. In the Spanish Canyon area, the potential severe disruption of the soil crust and subsequent compaction by heavy equipment may lead to sand dune formation and may fade geological contacts, which are now readily visible. The field operations conducted by the NTC are likely to degrade the physical characteristics of portions of the study area and could preclude research efforts that require pristine surface cover. This is regarded as a potential unavoidable impact.

In addition, this alternative will also restrict use of 2,000 acres of the northern portion of the Calico Mountains. Military operations will degrade these areas and result in a loss of opportunities for research and education. Impacts will be significant.

As with the Proposed Action, insufficient information is available to determine whether long-term study opportunities will be curtailed by the expansion. If natural resources under study are disturbed or destroyed, or the access constraints result in an inability to conduct continued research, a significant impact will result.

4.16.3.2 Mitigation

Mitigation measures for the Modified Coyote Basin Alternative will be the same as those described under the Proposed Action (Section 4.16.1.2) in addition to the following mitigation measure.

3. Movement of military equipment in Spanish Canyon will be restricted to a designated route established by the NTC. All other military operations/exercises shall be prohibited within this canyon. Signage shall be erected designating Spanish Canyon as a restricted access area for military equipment.

4.16.4 Alvord Alternative

4.16.4.1 Impacts

Implementation of the Alvord Alternative will result in similar impacts as those described under the Modified Coyote Basin Alternative, with the exception of the Calico Mountain Area. No areas within the Calico Mountains will be affected by military operations under this alternative.

4.16.4.2 Mitigation

Mitigation measures for the Alvord Alternative will be the same as those described under the Proposed Action (Section 4.16.1.2) and the Modified Coyote Basin Alternative (Section 4.16.3.2).

4.16.5 Superior Valley Alternative

4.16.5.1 Impacts

The Superior Valley Alternative will restrict access during military exercises to the Alvord Mountain area, which includes Spanish Canyon. Impacts will be significant. Approximately 2,000 acres in the northeast portion of the Calico Mountains will require restricted access during training exercises. Approximately 1,000 acres in the northern Mud Hills will be restricted during training events. The proximity of military exercises to heavily used research and education resources in the Mud Hills and Calico Mountains will result in a significant impact on people using resources adjacent to the military maneuver areas.

4.16.5.2 Mitigation

Mitigation measures for the Superior Valley Alternative are the same as those described under the Proposed Action (Section 4.16.1.2) and the Modified Coyote Basin Alternative (Section 4.16.3.2).

4.16.6 Avawatz Alternative

4.16.6.1 Impacts

The impacts of this alternative will be similar to those described under the Modified Coyote Basin Alternatives (Section 4.16.3.1).

4.16.6.2 Mitigation

Mitigation measures for the Avawatz Alternative are the same as those described under the measures for the Proposed Action (Section 4.16.1.2) and the Modified Coyote Basin Alternative (Section 4.16.3.2).

4.16.7 No Action Alternative

The No Action Alternative will allow continued opportunistic and unrestricted research and education opportunities in the Alvord Mountain area, the Mud Hills, West Cronese Basin, and the Soda and Calico Mountains. The Superior and Coyote dry lakebeds also provide opportunities for geological studies. Spanish Canyon has unique geological features that provide important future educational resources.

4.16.8 Cumulative Impacts

The Proposed Action will result in the withdrawal of 310,296 acres of public lands from direct BLM management. An additional 3,440 acres of BLM-managed public lands will be disturbed by cumulative projects. Insufficient information is available to determine whether long-term study opportunities will be curtailed by these cumulative projects. A significant impact will occur if natural resources under study are disturbed or destroyed or the access constraints results in an inability to continue research.

The mitigation described in Section 4.16.1.2 will reduce the Proposed Action's contribution to this impact.

4.16.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.16-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.16-2.

Table 4.16-1

EDUCATION AND RESEARCH - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Significant impact from restricted use of research areas -- Sheep Creek Springs, Silurian Hills Geologic Study Area, areas of Soda Mountains, and West Cronese Basin.	Significant impact from restricted use of access to research areas -- Sheep Creek Springs, areas of Soda Mountains, and West Cronese Basin.	Significant impact from restricted use of access to research areas -- Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, and Calico Mountains.	Significant impact from restricted use of research areas -- Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, Mud Hills, and Calico Mountains.	Significant impact from restricted use of access to research areas -- Alvord Mountain, Spanish Canyon, Calico Mountains, and Mud Hills.	Significant impact from restricted use of access to research areas -- Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, and Calico Mountains.	No impact.

Table 4.16-2

EDUCATION AND RESEARCH - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.

4.17 WILDERNESS CHARACTERISTICS

A significant impact on wilderness characteristics will occur if an impairment of wilderness values occurs, including any of the following:

- loss of apparent naturalness,
- loss of opportunity for primitive and unconfined recreation,
- loss of opportunity for solitude, and
- disruption of special features, such as bighorn sheep habitat and wild burro management areas.

4.17.1 Proposed Action

4.17.1.1 Impacts

Five WSAs will be affected by the Proposed Action. They are Death Valley National Park Boundary, Avawatz Moutains, South Avawatz Mountains, Kingston Range, and Soda Mountains WSAs.

Death Valley National Park Boundary

A total of 51,300 acres of Death Valley National Park Boundary WSA occurs within the Proposed Action. The presence of military operations in the northern part the expansion area will result in a significant impact on the wilderness value of the Park. Because the northern portion of this alternative is only proposed as a buffer zone, the impacts on the Park will be expected to be minimal.

Avawatz Mountains

All of the 61,320 acres of the Avawatz Mountains WSA will be affected by implementation of the Proposed Action. There will be a significant and unavoidable impact on the wilderness values of this WSA. Areas of low relief (less than 20-percent slopes) will be used for intensive vehicle maneuvers and aircraft support. In addition, these areas will serve as the primary staging area for rotational forces starting at the east end of the maneuver corridors. Some vehicle and regular foot-soldier use of steeper slopes will occur above 20-percent slopes. Intensive use of approximately 50 percent of the WSA within the boundary of the Proposed Action will denude the landscape. Apparent naturalness will be irreverisibly lost.

Visitors will be unable to feel isolated in the area. Opportunities for any type of recreation, including primitive or unconfined opportunities, will be completely unavailable for 215 or more days per year. These impacts will exacerbate the existing condition of the WSA, which is fragmented by cherry-stemmed roads and inholdings of patented mining claims. The overall result will be impairment of the entire WSA.

The associated disruption of bighorn sheep migratory or transitional habitat will impair this WSAs special characteristic.

South Avawatz Mountains

All of the 23,250 acres of the South Avawatz Mountains WSA will be impacted by implementation of the Proposed Action. A significant and unavoidable direct impact on this WSAs wilderness values will occur. Areas of low relief (less than 20-percent slopes) will be used for intensive vehicle maneuvers and aircraft support. Intensive use of approximately 60 percent of the WSA will denude the landscape. Apparent naturalness will be irreversibly lost.

Opportunities for solitude or primitive and unconfined recreation will be lost. Visitors will be unable to feel isolated in the area. Opportunities for any type of recreation, including primitive or unconfined opportunities, will be completely unavailable for 215 or more days per year. These impacts will impair the wilderness quality of the entire WSA, including areas outside of the acquisition area.

While not a designated special feature of this WSA, the disruption of bighorn sheep migratory habitat will eliminate an additional wilderness value.

Kingston Range

A total of 39,750 acres of this WSA lies within the Proposed Action. Intensive use of this WSA could denude the landscape. Apparent naturalness will be irreversibly lost because of the continued presence of military equipment and personnel.

Visitors will no longer have opportunities for solitude or primitive and unconfined recreation. Opportunities for any type of recreation, including primitive or

unconfined opportunities, will be completely unavailable for 215 or more days per year.

Soda Mountains

Approximately 43,428 acres, or about one-half of the existing WSA, will be impacted by implementation of the Proposed Action. Indirect impacts on the remainder of the WSA will also occur, and the unity of the WSA will be jeopardized. Intensive use of approximately 80 percent of the WSA lying within the acquisition boundary will denude the landscape. Apparent naturalness will be irreversibly lost because the evidence of human's activities will disrupt the natural setting. These impacts will directly affect the northwestern half of the WSA and impair the wilderness quality of the entire WSA, including the southeastern half, which lies outside of the expansion area.

While not a designated special feature of this WSA, the disruption of bighorn sheep habitat will eliminate an additional wilderness value.

4.17.1.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of funding:

1. Access routes into the Wilderness Areas from the NTC will be gated and posted with signs stating "You are entering a WSA."

4.17.2 Modified Avawatz-Silurian Alternative

4.17.2.1 Impacts

Under the Modified Avawatz-Silurian Alternative, the impacts previously discussed for the Avawatz Mountains, South Avawatz Mountains, Kingston Range, and for Death Valley National Park Boundary WSAs would be the same as for the Proposed Action. The Soda Mountains WSA will not be affected by this alternative.

4.17.2.2 Mitigation

Mitigation measures are the same as those described for the Proposed Action.

4.17.3 Modified Coyote Basin Alternative

4.17.3.1 Impacts

Three WSAs will be impacted with the implementation of the Modified Coyote Basin Alternative. The nature of the impacts on the three WSAs will be similar to those discussed under the Proposed Action. Like the Proposed Action, the Modified Coyote Basin Alternative will impact the entire South Avawatz Mountians WSA (23,250 acres) and approximately half of the Soda Mountains WSA (53,120 acres). Approximately 11,520 acres of the Avawatz Mountains WSA will also be impacted by the Modified Coyote Basin Alternative. A significant and unavoidable direct impact on wilderness values for the three WSAs will occur under this alternative.

4.17.3.2 Mitigation

Mitigation measures are the same as those discussed for the Proposed Action (Section 4.17.1.2).

4.17.4 Alvord Alternative

4.17.4.1 Impacts

The affected WSAs in the Alvord Alternative are the same as those in the Modified Coyote Basin Alternative.

4.17.4.2 Mitigation

Mitigation measures are the same as those described for the Proposed Action.

4.17.5 Superior Valley Alternative

4.17.5.1 Impacts

The nature and the magnitude of the impacts on the Avawatz and South Avawatz WSAs will be the same as those previously discussed for the Modified Coyote Basin Alternative. No direct impacts will occur in the Soda Mountains WSA.

4.17.5.2 Mitigation

Mitigation measures are the same as those described for the Proposed Action.

4.17.6 Avawatz Alternative

4.17.6.1 Impacts

Under this alternative, impacts on the Avawatz Mountains and South Avawatz Mountains WSAs will be the same as those described for the Superior Valley Alternative.

4.17.6.2 Mitigation

Mitigation measures are the same as those described for the Proposed Action.

4.17.7 No Action Alternative

Under the No Action Alternative, the Avawatz Mountains, South Avawatz Mountains, Death Valley National Park Boundary, Soda Mountains, and Kingston Range WSAs will not be directly impacted by NTC activities. Present boundaries of all but the Soda Mountains and Kingston Range WSAs currently border activities on the existing NTC. During military maneuvers, activities of man will be evident from within the WSAs from all points within line of sight of the NTC. In addition, aircraft use associated with the military maneuvers at the NTC and other military and commercial aircraft use will be evident from within all portions of these WSAs. The Soda Mountains WSA will be particularly subjected to aircraft noise because the civilian corridor follows I-15, parallel to the WSA boundary. Between rotations, only the roadways and battle corridors on the NTC will be evident from within the WSAs.

The legislatively designated Avawatz Mountains, South Avawatz Mountains, Death Valley National Park Boundary, Soda Mountains and Kingston Range WSAs would remain until Congress either designates them as wilderness or releases them in their entirety or portions thereof. Under the BLM Interim Management Policy, land uses would be restricted to the standard of maintaining the suitability of the areas for preservation as wilderness. Certain multiple uses that existed at the time of WSA designation could occur or continue to occur. New proposed uses not associated with prior existing rights would be significantly limited or denied. Any associated impacts from activities that would occur or be authorized under the Interim Management Policy are anticipated to be minimal in the long term.

4.17.8 Cumulative Impacts

Any withdrawal associated with implementation of the Army Proposed Action or other action alternatives would be cumulative to the approximately 7 million acres of lands withdrawn under the CDPA. Since the Proposed Action overlaps areas legislatively designated as WSAs and withdrawn, the cumulative aspect of implementation of the NTC acquistion would be associated with the approximately 100,000 acres outside currently withdrawn WSAs.

4.17.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each acquisition alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.17-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.17-2.

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Table 4.17-1

WILDERNESS CHARACTERISTICS - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Significant impact on Avawatz Mountains, South Avawatz Mountains, Kingston Range, and Soda Mountains WSAs.	Significant impact on Avawatz Mountains, South Avawatz Mountains, and Kingston Range WSAs.	Significant impact on South Avawatz Mountains, Soda Mountain, and Avawatz Mountains WSAs.	Significant impact on South Avawatz Mountains, Soda Mountain, and Avawatz Mountains WSAs.	Significant impact on South Avawatz Mountains and Avawatz Mountains WSAs.	Significant impact on South Avawatz Mountains and Avawatz Mountains WSAs.	No impact.

Table 4.17-2

WILDERNESS CHARACTERISTICS - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.

4.18 AIRSPACE

Impacts on airspace will be considered significant if loss of existing military or commercial airspace use occurs.

Refer to Section 3.18 for explanation of specific flight levels.

General Impacts

Expansion of the NTC boundaries into areas designated for special use airspace could result in mutual impacts between operations within the study area and within the special-use airspace areas.

In general, aircraft in the special-use airspace areas could be visible to air and ground forces within the NTC, thereby offering a "false scenario" with respect to staged battle conditions. Conversely, normal activity by ground forces within the NTC could result in distractions to pilots on separate missions within special-use airspace areas. Such distractions could include dust clouds caused by truck movements, glare produced by setting off flares, and others. NTC activity also involves the use of helicopters, which could conflict with other aircraft in special-use airspace. Close air support will eliminate low-level (below 3,000 feet) flight capability. The severity of impacts will vary somewhat among alternatives, as described below.

4.18.1 Proposed Action

4.18.1.1 Impacts

Air Force and other DOD use of the two visual flight routes will be curtailed during activity within expanded NTC boundaries, eliminating low-level test/training capability. NTC activity will consist of 12 rotations per year with 28 days per rotation (total of 336 days per year). Activity will occur primarily during predawn and morning hours. Alternative high-level routes do not meet Air Force tactical training requirements. The Air Force will not be able to meet mission training goals.

The Yuma, Dallas, and Miami contact points will be unusable. During activities in the southwestern, southeastern, and eastern parts of the NTC, ground forces could see aircraft holding at the various contact points. This is an important aspect of contact points because the aircraft using them should be out of visual range of ground forces. Contact point Yuma is further degraded because, for NTC purposes, contact points also double as holding points for flights of aircraft that have not received clearance into the NTC airspace. The Air Warrior function, which mandates the need for contact points, has recently been transferred from George AFB to Nellis AFB in light of George AFB's closure. Nellis AFB will propose new contact point locations when final NTC boundaries have been determined. Depending on their locations, additional environmental analysis might be warranted at that time. Cost associated with establishing new contact points, including possible environmental analysis, will be funded by the Army. With the replacement of the contact points, no significant impacts will remain.

Air Force sources were contacted to assess the potential impact on ground soldiers from Air Force flight operations. Airspace used by the Air Force in this area includes two visual flight routes (VR-1214 and VR-1215) and IR-212. The visual routes have been in existence for approximately 15 years. During that time, the Air Force has conducted approximately 5,000 to 6,000 sorties per year with no accidents. The Air Force also conducts detailed terrain hazard reconnaissance twice a year to enhance operational safety (Robert A. Thackery, Deputy of Operations, 35th Tactical Training Wing, George AFB, personal communication 1992). Based on this historical information, it can be concluded that the safety of persons and property on the ground is not unduly compromised by Air Force use of the airspace.

V-394, the civil airway, currently lies outside of the NTC boundaries. With the Proposed Action, a portion of the airway will overlie the alternative. The portion of the airway that overlies the Proposed Action is already in military-controlled airspace. No significant adverse impacts are expected.

4.18.1.2 Mitigation

No mitigations are necessary.

4.18.2 Modified Avawatz-Silurian Alternative

4.18.2.1 Impacts

This alternative will result in similar impacts on airspace as the Proposed Action described above.

4.18.2.2 Mitigation

No mitigations are necessary.

4.18.3 Modified Coyote Basin Alternative

4.18.3.1 Impacts

The flight routes VR-1214, VR-1215, and IR-212 do not fall within this alternative, but VR-1217 and VR-1218 will overlie part of this alternative. A small portion of the conventional pattern south will be affected. Use of the eastern one-half of the Cords Road Test Area will be affected during air/ground operations within the NTC. This will limit use of the area during such times and require substituting another landmark for Coyote Lake, the current visual reference for the eastern end of the corridor.

The eastern two-thirds of the Black Mountain Supersonic Corridor, the Black Mountain Terrain Following Route, and the Ventura Holding Point will be affected during NTC activities. Aircraft use of these areas would be limited during such times to avoid interfering with air/ground operations within the NTC.

Airspace impacts would be significant but to alleviate the impacts, the Army will replace the Yuma, Dallas, and Miami contact points. They will do this because these contact points will be unusable during activities in the southwestern, southeastern, and eastern areas, respectively, of the NTC, and they will not be out of visual range of ground soldiers during military operations.

With the replacement of the contact points, no significant impacts will remain. A portion of V-394, the civil airway, will overlie the alternative. The portion of the airway that overlies this alternative is already in military-controlled airspace. No significant adverse impacts are expected.

4.18.3.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of NTC funding:

1. A Memorandum of Understanding (MOU) shall be developed between the NTC and the Air Force Flight Test Center at Edwards AFB in relation to the Cords Road Test Area, the Black Mountain Supersonic Corridor, the Black Mountain Terrain Following Route, and the Ventura Holding Point.

4.18.4 Alvord Alternative

4.18.4.1 Impacts

As with the Modified Coyote Basin Alternative, the Army will replace the Yuma, Dallas, and Miami contact points in training operations. Use of the Yuma contact point as a holding area for aircraft awaiting NTC clearance will not be affected. The Air Force indicates that the holding pattern can be slightly adjusted, if necessary.

With the replacement of the contact points, no significant impacts will remain. A portion of V-394, the civil airway, will overlie the alternative. The portion of the airway that overlies this alternative is already in military-controlled airspace. No significant impacts are expected.

4.18.4.2 Mitigation

Mitigation Measure 1 shall apply to this alternative (Section 4.18.3.2).

4.18.5 Superior Valley Alternative

4.18.5.1 Impacts

The Army will replace the Yuma and Miami contact points in training operations. The Dallas contact point will be unaffected. Major portions of the conventional pattern south overlie the study area and will be significantly impacted because it will be unusable during NTC operation. Significant adverse impacts on the Cords Road Area, Black Mountain Supersonic Corridor, the Black Mountain Terrain Following Route, and the Ventura Holding Point will also result because use of the eastern 19 and 12 miles, respectively, of these airspace areas will also be unusable. In addition, the conventional pattern west, although outside of the study area, will be unusable because entry to that pattern will be unusable.

4.18.5.2 Mitigation

Mitigation Measure 1 (Section 4.18.3.2) shall apply to this alternative.

4.18.6 Avawatz Alternative

4.18.6.1 Impacts

The Army will replace the Yuma and Miami contact points in training operations and the Yuma contact point as a holding area for aircraft awaiting NTC clearance. The Dallas contact point will not be affected. The Avawatz Alternative will affect the eastern 5 miles of the Cords Road Test Area, the eastern 3 miles of the Black Mountain Supersonic Corridor, and the Black Mountain Terrain Following Route because they will be unusable during NTC operations.

4.18.6.2 Mitigation

Mitigation Measure 1 (section 4.18.3.2) shall apply to this alternative.

4.18.7 No Action Alternative

4.18.7.1 Impacts

Existing military and civil airspace uses, as described in Section 3.18, and existing operations at the NTC will continue. The existing airspace coordination system will continue.

Implementation of the WMLTA Project will result in the acquisition by the BLM of approximately 35,000 acres of private land within the NTC expansion proposal study area. Acquisition and management of this land by BLM, when coupled with acquisition of an additional 200,000+ acres of private land beneath airspace used by the Air Force, will tend to reduce the risk of conflicts between airspace use and surface use. Public lands, both current and acquired, will be managed by the BLM in accordance with an MOU between the BLM and the Air Force to reduce land use and airspace conflicts (BLM 1988e). This will result in a net benefit to Air Force airspace use.

4.18.7.2 Mitigation

No mitigations are necessary.

4.18.8 Cumulative Impacts

Implementation of any of the NTC alternatives will impact visual flight corridors. Any land designated as wilderness or park/preserve would be excluded from MOAs. There will be no contribution to cumulative impact from other cumulative projects.

4.18.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.18-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.18-2.

Table 4.18-1

AIRSPACE - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Army will replace three USAF contact points. No significant impacts are expected.	Army will replace three USAF contact points. No significant impacts are expected.	Army will replace three USAF contact points. Significant impact from restricted use of USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point.	Army will replace three USAF contact points. No significant impacts are expected.	Army will replace three USAF contact points. Significant impact from restricted use of USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point.	Army will replace two USAF contact points. Significant impact from curtailed use of USAF's Cords Road Area, Black Mountain Supersonic Corridor, and Black Mountain Terrain Following Route.	No impact.

Table 4.18-2

AIRSPACE - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Route reduced to not significant.	No significant impacts are expected.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Route reduced to not significant.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Route reduced to not significant.

4.19 AESTHETICS/VISUAL RESOURCES

Visual Contrast System

The BLM has an established Visual Contrast Rating System, which uses a method of assessing changes in visual qualities of project sites based on the amount of contrast a project will have with existing conditions. The process is based first on assessing the visual quality of a landscape through application of the Visual Contrast Rating System.

In the Visual Contrast Rating System, each landscape feature is assigned a weighted numerical value based on its significance when placed in the existing landscape. Under this established system, first, three basic landscape "features" are identified and include structures, land surface, and vegetation. Second, the four "elements of landscape character" are assigned numerical values based on their importance. These values are 4 for form (considered most important), 3 for line, 2 for color, and 1 for texture (considered least important).

Each feature is then combined with each character element, and the contrast between the proposed activity and existing conditions is determined by assigning numerical values according to the degree of contrast. These values include 3 for strong contrast, 2 for moderate contrast, 1 for weak contrast, and zero for no contrast. The element value multiplied by the degree of contrast value indicates the magnitude of visual impact. Scores are then totaled separately for each of the landscape features (structures, land surface, and vegetation) and are defined by the categories as shown in the table below.

No contrast	0 points	The element contrast is not visible or perceived.
Weak contrast	1 to 10 points	Contrast can be seen but does not attract attention.
Moderate contrast	11 to 20 points	Attracts attention and begins to dominate.
Strong contrast	21 to 30 points	Demands attention and will not be overlooked by the average viewer.

This system is meant to be used as a tool and not as a final determination of significance criteria. The system produces three values. In some cases, one feature may not attract attention at all, while another attracts attention and cannot be overlooked, thus making the level of significance of a project hard to determine. Thus, in addition to the rating obtained through this system, consideration has to be made of the level of sensitivity of the public to changes in the landscape, including their viewing distance, as well as other factors including atmospheric and lighting conditions. Visual perceptions of human intrusions on most landscapes are affected by changing light and atmospheric conditions. A power pole and line could stand out starkly when highlighted by a setting sun but may disappear when viewed through wind-raised dust during mid-day. A reflective white or light surface can be seen for miles under certain conditions but can be very unobtrusive if backlit.

Comparison to Visual Resource Management Objectives

The contrast ratings are compared to the objectives for the approved Visual Resource Management (VRM) class or classes within which the Proposed Action or alternatives are located. Classes that could be affected for the Proposed Action and alternatives include the following:

- **Class II** - The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any change must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

- **Class III** - The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- **Class IV** - The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view

and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic elements.

Impact Significance Criteria

For this analysis, impacts were considered to be significant if the visual contrast rating for proposed activities results in an increase in visual contrast that is not in conformance with the VRM class objective for that location.

4.19.1 Proposed Action

4.19.1.1 Impacts

Project actions will involve major military action travel across most lands within this alternative area. Impacted areas could be denuded of vegetation. During active maneuvers, dust clouds will be created from the larger numbers of military vehicles operating in flat areas. The consequences to a viewer will depend on the viewer's distance from the active area; however, dust will result in an obstruction of nearground, middleground, or background views. In some instances, dust clouds could impair visibility along public access, especially on Highway 127. Exceptions to the use of large numbers of vehicles include steep areas exceeding 20-percent slope. These areas, however, may be subject to degradation by smaller vehicles that have the capability to traverse such slopes. Additionally, there will be foundation areas for camera equipment stationed in mountain locations. Roadways may be required to reach these mountain areas, resulting in cuts in mountain sides. Additionally, there may be locations along Highway 127 that will require construction of undercrossings to allow military vehicles to cross Highway 127 during active maneuvers. These crossings will be a permanent modification of this access corridor.

Areas along the northern portion of the Proposed Action study area are designated as buffer zone areas only. No actions are expected to occur along this approximately 1½-mile-wide corridor.

Key observation points (KOPs) have been identified from areas accessible to the general public within the study area and are described in Section 3.19. Most public access is limited to I-15 and Highway 127. From these areas, viewsheds are typically described as presented in Section 3.19 with foreground and middleground views generally flat, and background views of mountainous terrain.

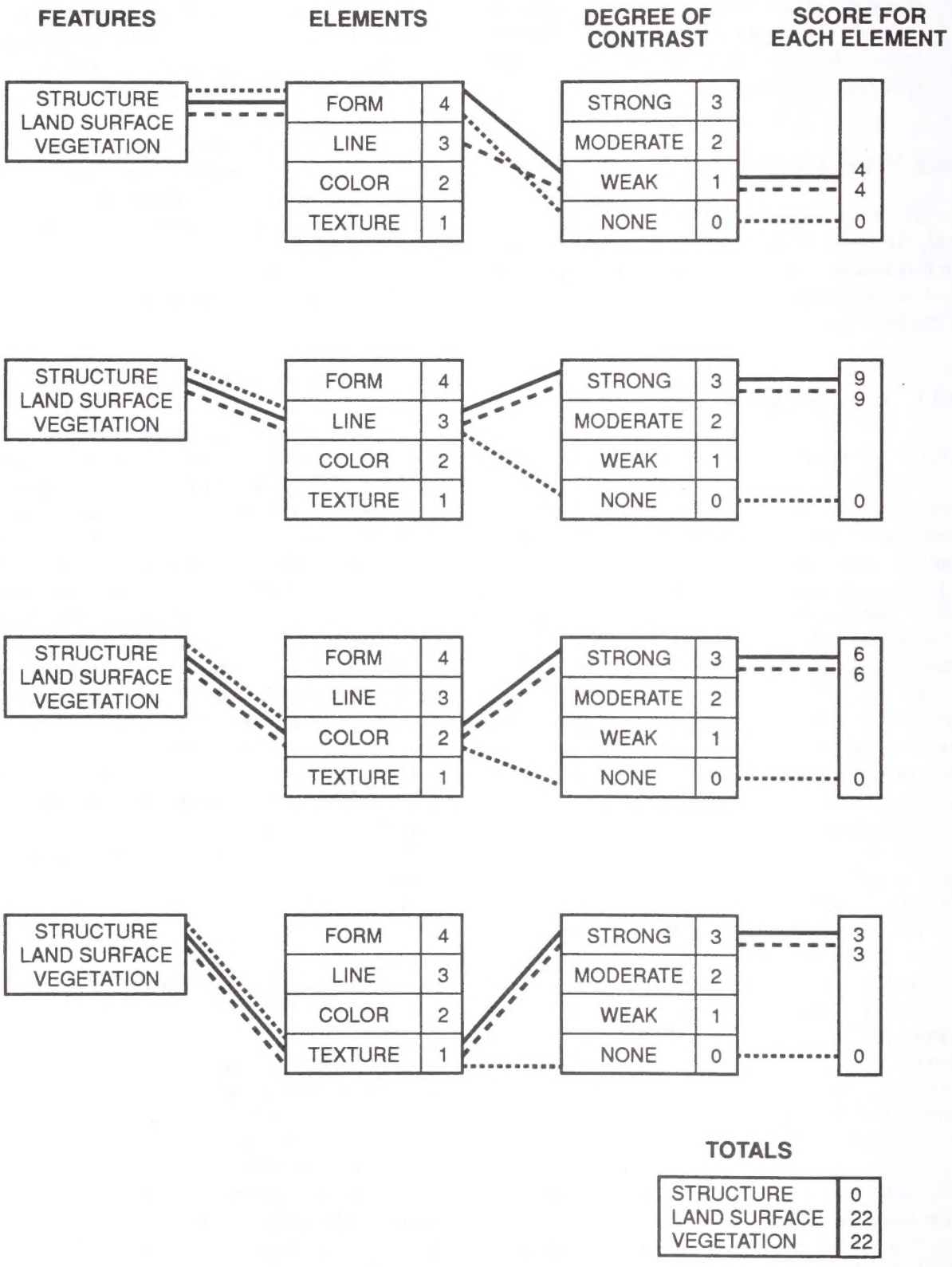
For this analysis, the VRM contrast rating system has been applied to two assumed KOPs. The first assumed KOP addresses contrast for project activities resulting from degradation and denuding of the vegetation from heavy vehicle travel. The second assumed KOP addresses the contrast pertaining to the undercrossings that will be placed along Highway 127.

Key Observation Point of General Project Actions

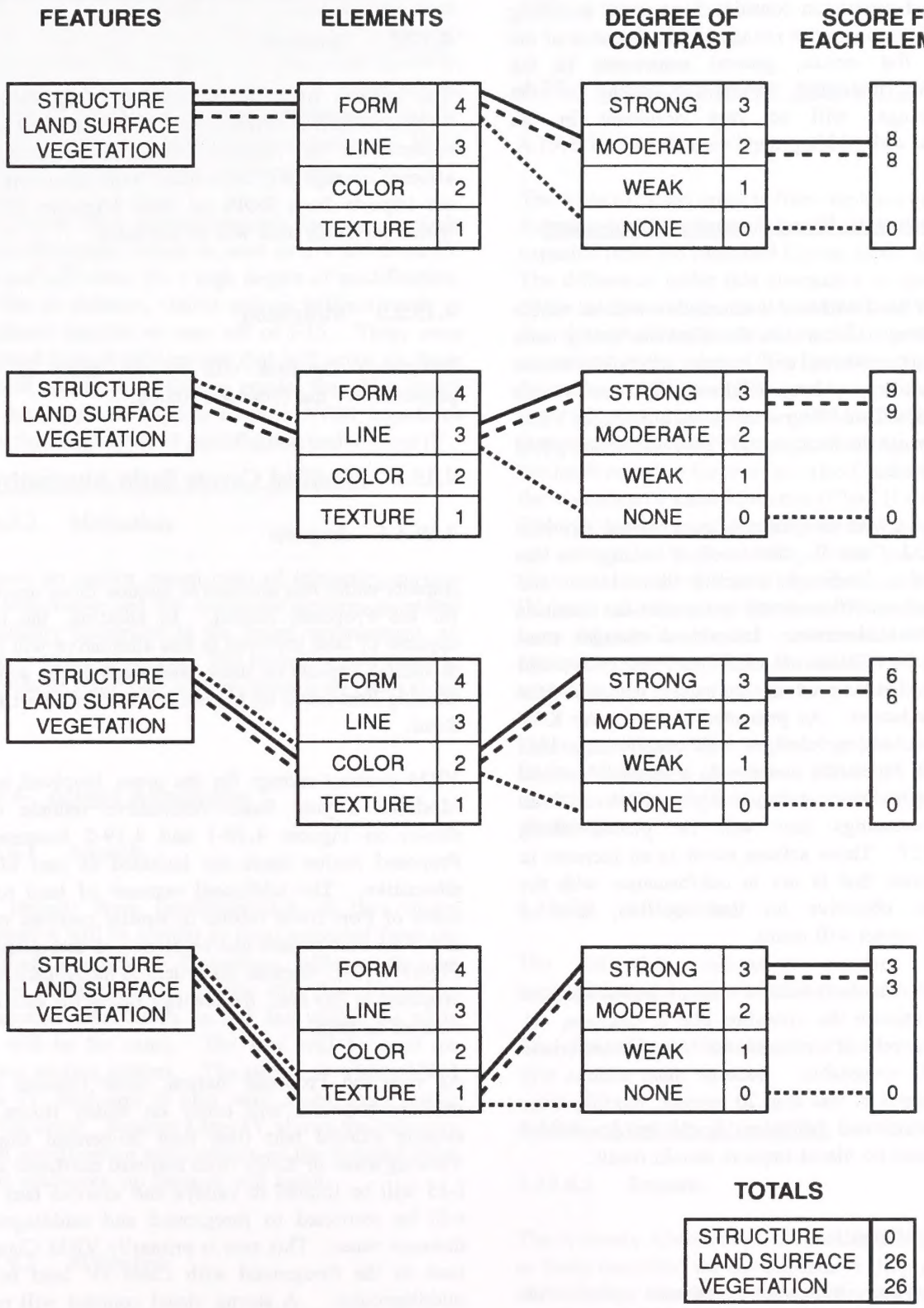
The VRM contrast rating for KOPs having views of general project activities without views of Highway 127 undercrossings is presented on Figure 4.19-1. No permanent structures will be placed in the expansion areas studied, and thus, a contrast rating for structures results in a no contrast rating. The features that result in modifications to expansion areas include changes in land surface and vegetation that both result in strong ratings of 22. A strong visual contrast will result because linear elements will appear in the viewshed from cross-country traffic. Not only will ruts and smooth areas change the surface form of the desert, but changes will occur from the loss of vegetation, which will result in a smooth, nontextured appearance. It should be noted that, while there will be no permanent structures and the BLM VRM system does not take mobile sources into consideration, the maneuvers themselves will be a strong visual element of the viewshed.

Key Observation Point of Tank Crossings at State Highway 127

The VRM contrast rating for KOPs with a viewshed of the undercrossings along Highway 127 is presented on Figure 4.19-2. The feature of structures applied to the contrast rating systems results in no contrast rating because no permanent structure will be constructed. Line, color, and texture result in moderate levels of contrast with existing conditions. Linear elements will appear to cross the existing Highway 127, color will be modified to a dark gray or a black roadway that will contrast with existing desert terrain, and texture will be taken away where military activity and construction of the undercrossings occur.



VRM CONTRAST RATING FOR KOPs OF GENERAL PROJECT ACTION NOT IN VICINITY OF TANK CROSSINGS
Figure 4.19-1



VRM CONTRAST RATING FOR KOPs WITH TANK CROSSINGS ALONG ROUTE 127 AND GENERAL PROJECT ACTIONS

Figure 4.19-2

As stated above for general project actions, the land surface and vegetation considerations result in strong degrees of contrast with ratings of 26. Because of the generally flat terrain, general maneuvers in the foreground, including the areas leading to the undercrossings, will be very dominant in the foreground and middleground viewsheds.

Comparison with Visual Resource Management Objectives

Portions of land within this alternative will be visible from Highway 127 within the Silurian Valley area because this roadway will remain accessible to the general public. Along Highway 127, the visible foreground and middleground views are within VRM Class II, while the background views are within VRM Class III lands.

In accordance with the allowable management activities under VRM Class II, the level of change to the characteristic landscape should be low, and management activities should not attract the attention of the casual observer. Introduced changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the existing landscape. As presented above in the KOP descriptions, strong changes will result from land surface and vegetation changes as a result of project actions. In addition, strong changes will result from the undercrossings that will be placed along Highway 127. These actions result in an increase in visual contrast that is not in conformance with the VRM class objective for that location; thus, a significant impact will result.

Project activities that could be seen in the background will not dominate the viewshed due to distance. A moderate level of change to the characteristic landscape is acceptable. Because most actions will occur on slopes of less than 20 percent, modifications to any background hillsides should be considered moderate, and no visual impacts should result.

4.19.1.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of NTC funding:

1. To the extent possible, new roadways and undercrossings shall be designed to blend into the surrounding landscape.

4.19.2 Modified Avawatz-Silurian Alternative

4.19.2.1 Impacts

The impacts from implementation of the Modified Avawatz-Silurian Alternative will be similar to those expected for the Proposed Action. Although the total affected acreage will be smaller with this alternative, the impacts from KOPs on State Highway 127 and within the study area will be the same.

4.19.2.2 Mitigation

Mitigation measures will be the same as those presented for the Proposed Action.

4.19.3 Modified Coyote Basin Alternative

4.19.3.1 Impacts

Impacts under this alternative include those described for the Proposed Action. In addition, the larger expanse of land involved in this alternative will result in similar impacts on those land areas to the south of existing Fort Irwin up to, but not west of, Fort Irwin Road.

VRM contrast ratings for the areas involved in the Modified Coyote Basin Alternative include those shown on Figures 4.19-1 and 4.19-2 because the Proposed Action lands are included as part of this alternative. The additional expanse of land to the south of Fort Irwin results in similar contrast rating levels for land surface and vegetation as that shown on Figure 4.19-1. Because no structural modifications are proposed in this area, the contrast rating for structures remains as zero.

As with the Proposed Action, most impacts from military activities will occur on valley floors and sloping alluvial fans (less than 20-percent slopes). Viewing areas or KOPs from Harvard northeast along I-15 will be limited to valleys and alluvial fans and will be restricted to foreground and middleground distance zones. This area is primarily VRM Class III land in the foreground with Class IV land in the middleground. A strong visual contrast will result because linear elements will appear in the viewshed from cross-country traffic, and, as with the Proposed Action, denuded areas and a smoothing of the texture of the desert surface will result. Impacts within the

foreground will result in significant impacts when compared to VRM Class III management objectives. Military maneuvers and land degradation will attract attention and dominate the view of the casual observer, which is not in conformance with management objectives. Actions in the middleground in Class IV areas will be acceptable under terms of VRM objectives, and no impacts are expected.

Background view actions through this area include Alvord Mountain, which is rated as a VRM Class IV area and will allow for a high degree of modification, and due to distance, visible actions will not result in significant impacts as seen off of I-15. Thus, even proposed limited military use that will occur on these areas of greater relief (slopes greater than 20 percent) will not result in impacts because VRM objectives allow for a high level of modification under Class IV.

4.19.3.2 Mitigation

Because no known means exist of mitigating surface soil disturbance and the associated erosion generated by military equipment in the desert environment, no mitigations are proposed. The project would result in unavoidable significant adverse impacts on views along I-15.

4.19.4 Alvord Alternative

4.19.4.1 Impacts

The impacts from implementation of the Alvord Alternative will be similar to those expected from the Modified Coyote Basin Alternative. Although the total affected acreage will be smaller with this alternative, the impacts from KOPs on I-l5 and within the study area will be the same. The land will be used for various staging actions. The parcel is within VRM Class IV land and is also well away from public viewing areas. Because Class IV allows for extensive visual modification and because of the distance from public roadways, no impacts will result.

4.19.4.2 Mitigation

Because no known means exist of mitigating surface soil disturbance and the associated erosion generated by military equipment in the desert environment, no mitigation are proposed. The project would result in unavoidable significant adverse impacts on views along I-15.

4.19.5 Superior Valley Alternative

4.19.5.1 Impacts

The types of visual impacts from implementation of the Superior Valley Alternative will be similar to those expected from the Modified Coyote Basin Alternative. The difference under this alternative is that a portion of the land area on the southeastern side of the existing Fort Irwin will be eliminated, and all proposed land acquisition to the west of Fort Irwin Road will be used for military activities. The land area on the southeast that will be eliminated is Class III land in the foreground and Class IV land in the background, while the lands added to the west are also Class IV land with the exception of Lane Mountain (Class II and III). All Class IV lands have fair ratings in background views, and neither has high visibility to the general public. No visual impacts will result from actions within Class IV lands added area to the west. If actions involve Lane Mountain, impacts could result from VRM objectives on the Class II and III lands of this mountain.

Other impacts remain as for the Modified Coyote Basin Alternative; however, Class III foreground impacts along I-15 northeast of Harvard are eliminated.

4.19.5.2 Mitigation

The following mitigation measure shall be implemented, subject to availability of funding:

2. Delete Lane Mountain from the expansion.

4.19.6 Avawatz Alternative

4.19.6.1 Impacts

The Avawatz Alternative will result in similar impacts as those described for the Superior Valley Alternative above except that the far western portion of the study area is not included in this alternative. This area is primarily Class IV land but does include Lane Mountain. Under this alternative, any potential

impacts on the Class II and III lands of Lane Mountain will be eliminated.

4.19.6.2 Mitigation

No significant adverse impacts have been identified, and no mitigation measures are required.

4.19.7 No Action Alternative

Under BLM management, dispersed uses of study area public lands promote limited visual intrusion against the natural character of the landscape. BLM manages uses of the area to consider the specific objectives of VRM class objectives. Under this alternative, this means that no new uses of the land in proposed expansion areas will occur. Existing activities will remain in conformance with VRM class objectives, and no impacts will result.

4.19.8 Cumulative Impacts

The proposed NTC action will contribute incrementally to the visual degradation in the Mojave Desert. This will be primarily due to the loss of vegetation and not the creation of structures or alteration of major landforms.

Cumulatively, the described projects and future development would transform the existing desert environment in localized area to areas that appear to be disturbed. Travelers along Highway 127, I-40, and I-15 would see visual disturbance from project elements located near the roadways. Off-road (where allowed) or other users of the land would see disturbance from other localized locations. Cumulative visual impacts will occur on a localized scale; however, as the projects are spread out, the impact of visual disturbance within the greater desert area will not result.

4.19.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.19-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.19-2.

Table 4.19-1

AESTHETIC RESOURCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Significant impact on views along Highway 127.	Significant impact on views along Highway 127.	Significant impact on views along I-15.	Significant impact on views along I-15.	Significant impact if actions involve Lane Mountain.	No significant impact expected.	No impact.

Table 4.19-2

AESTHETIC RESOURCES - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Impacts on views along Highway 127 remain significant.	Impacts on views along Highway 127 remain significant.	Impacts on views along I-15 remain significant.	Impacts on views along I-15 remain significant.	Impacts on views of Lane Mountain reduced to not significant.	No significant impacts are expected.

4.20 SOLID WASTE AND HAZARDOUS SUBSTANCES

The term "solid waste" is used to define nonhazardous waste and materials resulting from domestic refuse, mining operations, vegetative debris from clearing of land, sewage sludge, and building debris.

The terms "hazardous substances" and "hazardous materials" are used in a manner generally consistent with Title 22 of the California Code of Regulations. Generally, these guidelines are based on the toxicity, corrosivity, ignitability, and reactivity of the material, and are often used interchangeably.

Impacts from solid waste and hazardous substances are considered significant if any of the following will occur:

- solid waste placement will create a nuisance, increase erosion and/or sedimentation potential, increase potential for land settlement and/or landslide, create an eyesore and/or noxious odors, or attract vermin or undesirable wildlife;
- an increase in the generation of hazardous substances will require disposal to regional landfill and/or treatment facilities;
- activity that will spread or exacerbate an existing hazardous substances site by directly spreading the substances or causing the substances to be spread by the alteration of land forms, drainage, or other means;
- the generation of hazardous substances and/or materials will expose the general public to health risks through direct exposure, groundwater contamination, and/or airborne contaminants;
- the generation of hazardous substances and/or materials will expose wildlife or vegetation outside of the project area in a manner that is detrimental to longevity or propagation; and/or
- the generation of nonionizing and/or ionizing radiation will expose the general public to established harmful effects.

4.20.1 Proposed Action

4.20.1.1 Impacts

The area within the Proposed Action has been investigated in sufficient detail for the presence of hazardous substances sites related to mining, commercial, domestic, and illegal land use activities (i.e., drug labs, illegal dumping) (Chambers Group 1991b, 1992a). These reviews included site inspections and searches of applicable agency records.

The area within the Proposed Action contains mining sites that have potentially hazardous substances and/or materials present. Impacts from these sites are potentially considered less than significant in relation to the size of the sites and remoteness in rugged terrain relative to the magnitude of the land acquisition area. Some of these sites do pose manmade geological hazards that are discussed in Section 4.2.

The hazardous substances impacts associated with conducting military exercises within the Proposed Action will include spills of oil, grease, lubricants, hydraulic fluids, battery electrolytes, and fuels from vehicle refueling, equipment breakage, and field repairs. The NTC presently has policies and procedures intended to minimize the potential for such releases or other damage to the environment from hazardous materials. These policies and programs are expected to apply equally to the Proposed Action area as they do to the existing operations on the NTC. In addition, because the same amount of equipment and personnel will be used over a larger area, the concentration of potential spills will be less.

The motor pooling of the OPFOR vehicles and rotary aircraft will remain in the same location in the NTC with maintenance facilities set up to handle and store hazardous materials. Therefore, the policies and programs already established should be effective and should prevent significant impacts.

The amount of personnel will not increase with the proposed expansion; therefore, there will be no anticipated increase in the amount of solid nonhazardous waste and/or sewage sludge generated. Force staging areas currently use portable latrines that are pumped out into the NTC's sewage treatment facility. This will also be a practice in the Proposed Action areas. During NTC force-on-force maneuvers or National Guard training exercises, field latrines will be used. No significant impacts are anticipated from these practices.

Because the amount of Resource Conservation and Recovery Act (RCRA) material will not be increased with the Proposed Action, there are no significant impacts anticipated.

4.20.1.2 Mitigation

Because there are no established or anticipated significant impacts, no mitigation is necessary.

4.20.2 Modified Avawatz-Silurian Alternative

4.20.2.1 Impacts

The impact analysis for this alternative is similar to the Proposed Action. There are no significant impacts expected.

4.20.2.2 Mitigation

Because there are no established or anticipated significant impacts, no mitigation is needed.

4.20.3 Modified Coyote Basin Alternative

4.20.3.1 Impacts

The aforementioned hazardous substances study conducted by Chambers Group (1991b) covered the areal extent of this alternative. Some mining sites that have potentially hazardous materials are present. Impacts from these sites are potentially considered less than significant in relation to the size of the sites and their remoteness relative to the magnitude of this alternative. Some of these sites do pose manmade geological hazards, which are discussed in Section 4.2.

The implementation of this alternative will spread out the military maneuver forces over a larger area, which will lessen the concentration of spills from equipment and fueling. For this alternative, the impacts from spills are considered less than significant because the NTC will implement the same hazardous substances cleanup measures now being used.

Because the number of personnel will remain the same, there will be no significant impacts caused by solid and nonhazardous waste generation.

4.20.3.2 Mitigation

Because there are no established or anticipated significant impacts, no mitigation is needed.

4.20.4 Alvord Alternative

4.20.4.1 Impacts

The impact analysis for this alternative is the same as for the Modified Coyote Basin Alternative and, as such, there will be no significant impacts.

4.20.4.2 Mitigation

No mitigation is necessary.

4.20.5 Superior Valley Alternative

4.20.5.1 Impacts

The impact analysis for this alternative is similar to the Modified Coyote Basin Alternative. There are no significant impacts expected.

4.20.5.2 Mitigation

No mitigation is necessary.

4.20.6 Avawatz Alternative

4.20.6.1 Impacts

The impact analysis for this alternative is similar to the Modified Coyote Basin Alternative. There are no significant impacts expected.

4.20.6.2 Mitigation

No mitigation is necessary.

4.20.7 No Action Alternative

Military exercises and equipment support will be limited to the existing levels at the Fort Irwin Military Reservation and within its boundaries. Therefore, the

amount of hazardous materials used and generated will be expected to remain constant.

The inspection and monitoring of hazardous materials storage and handling facilities will continue to be performed under the auspices of NTC regulations promulgated according to the Department of Public Works. Under these regulations, NTC will continue to comply with RCRA for the inventory, storage, handling, recycling, and disposal of hazardous materials. Therefore, no significant adverse impacts are anticipated.

Contaminated soils generated from spills of oil, grease, lubrication fluid, hydraulic fluid, and fuels from fueling and maintenance of vehicles and equipment will continue to be removed from the field. Stockpiling of this hazardous substances at the NTC Class III landfill is no longer permitted, and the material is now decomposed through a permitted bioremediation program. Therefore, no significant adverse impacts will result in the continued military field operations that generate this type of waste.

Current operations preclude the use of ionizing radiation. Nonionizing radiation from military electrical equipment is shielded as necessary. Based on the current state of knowledge and the EPA's opinion, there will be no significant adverse impacts from nonionizing radiation from electrical power transmission lines.

Because there are no significant impacts expected under the No Action Alternative, no mitigation measures are proposed.

4.20.8 Cumulative Impacts

Solid waste generated by the cumulative projects as well as growth within the local communities would cumulatively add to the amounts taken in by local landfills. These increases in amounts of solid waste would incrementally shorten the life of the landfills.

Because there will be no increase in the amount of RCRA treatable waste generated or solid nonhazardous waste needing disposal off of the Fort Irwin Military Reservation, the NTC will not contribute to cumulative impacts on regional facilities that will need to store or recycle such waste.

4.20.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.20-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.20-2.

Table 4.20-1

SOLID WASTE AND HAZARDOUS SUBSTANCES - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
No significant impact expected.	No significant impact expected.	No significant impact expected.	No significant impact expected.	No significant impact expected.	No significant impact expected.	No impact.

Table 4.20-2

SOLID WASTE AND HAZARDOUS SUBSTANCES - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
No significant impact expected. No mitigation is required.	No significant impact expected. No mitigation is required.	No significant impact expected. No mitigation is required.	No significant impact expected. No mitigation is required.	No significant impact expected. No mitigation is required.	No significant impact expected. No mitigation is required.

4.21 HEALTH AND SAFETY

Evaluation of the Proposed Action's health and safety impacts is based on both the potential for accidents and any health risks from normal project operations. The significance of an adverse safety impact increases as either (or both) of these two parameters increase. By definition, adverse safety impacts result only from abnormal operation of a project. Beneficial impacts may result from any direct or indirect safety improvements resulting from project implementation.

In the following analysis, potential impacts related to public safety and/or environmental health were considered significant if project implementation will

- interfere with emergency response or evacuation plans;
- expose humans to hazardous materials or hazardous waste;
- generate hazardous materials or hazardous waste in quantities or of a type that could not be accommodated by the current county collection system;
- result in an increased likelihood of an uncontrolled release of hazardous materials that could contaminate soil, surface water, and groundwater;
- expose humans to slips, falls, and/or entrapment within an enclosed space;
- create a situation involving personal endangerment or unusual risk to employees, visitors, residents, or the general public located offsite; and/or
- create or exacerbate an existing fire hazard or expose people to high fire hazard conditions without adequate fire protection.

4.21.1 Proposed Action

4.21.1.1 Impacts

The impacts on human health and safety that will result from military maneuvers in the Proposed Action can be classified, in general, as geological, hydrological, biological, and climatic hazards. The impacts resulting from seismic events within the boundary of this alternative or in the vicinity will be the same as they are currently. Because maneuvers will be conducted primarily in the open terrain, the hazards from surface rupture and falling rocks are not significant.

During and after heavy rainstorms, there is a risk of flashflooding that could result in injuries or death for any soldiers or civilians caught in the floods. The risk of flooding and erosion could be increased from the current level as a result of crushing and removal of vegetation that impedes the flow of runoff and holds the soils in place. The increased health and safety hazards resulting from flash floods are not significant.

The possibility of soldiers being bitten by poisonous reptiles or spiders, or being stung by scorpions exists within the boundaries of the proposed alternative. Incidences between poisonous reptiles and invertebrates and soldiers will not be expected to be common. The human health and safety impacts resulting from these incidences will be less than significant.

Potential safety hazards include the operation of military vehicles in the existing utility corridors. Approximately 70 square miles of utility corridor are within the Proposed Action alternative. The impact of a tank or other military vehicle with a utility tower could not only result in injuries from the collision but also in potential electrocution hazards if the integrity of the tower is affected. In addition, some of the power poles located within this alternative may be low enough that high-profile vehicles could potentially come into contact with electrical wires. This could also result in an electrocution hazard. The presence of high-pressure natural gas pipelines in the utility corridor may also represent a safety hazard if heavy military vehicles continually cross at the same points or if maneuver activities compromise the integrity of the underground pipeline. There is also a risk of military aircraft colliding with overhead transmission lines. These potential safety impacts associated with military vehicles crossing the utility corridor are considered significant.

There is a potential safety risk to military vehicles operating in close proximity to overhead electrical transmission lines and underground natural gas pipelines during a seismic event. The risks are related to electrocution and/or injury if the overhead lines break, a utility tower topples, or underground pipeline ruptures. These impacts could be considered significant.

Performing maneuvers in the desert environment has the potential for significant impacts on the health and safety of humans, particularly if the soldiers are not appropriately trained. The combination of the heat and physical activity could result in heat stroke or heat exhaustion. The impacts are not expected to be any different than they currently are in the existing maneuvers at Fort Irwin. The only difference is the longer distances that the soldiers will travel through the course of the maneuvers.

The possibility exists for soldiers to be stranded in the desert due to broken down vehicles or separation from their training units. This could result in a significant health risk to the stranded soldiers if they are not supplied with adequate water and shade.

The health and safety impacts from windblown dust near State Highway 127 are considered significant because heavy dust clouds could cause accidents on this highway. Low visibility along the highway could result from maneuvers occurring in close proximity to the highway.

Army vehicles will use the proposed undercrossings to cross State Highway 127 and avoid interruptions in normal traffic operation. Soldier movement visible from State Highway 127 may be a distraction to motorists and result in traffic slowing. However, because this will not result in lane closure or traffic stopping, this will result in a less than significant impact.

There is a potential for significant health and safety risks for civilians straying into maneuver areas from State Highway 127 or other dirt roads that traverse portions of the Silurian Valley. If civilians drive off of the main roads or engage in off-road activities in the maneuver areas, there may be a significant risk of accidents with soldiers or military vehicles. This could result in injuries or fatalities, which would be a significant impact.

The potential for brush fires will increase with the increase in human and equipment activity. This risk will be the same as the current risk on Fort Irwin where brush fires historically have not posed a problem. Therefore, this will not be a significant impact associated with the land acquisition by the NTC.

4.21.1.2 Mitigation

In addition to Mitigation Measures found in Section 4.8.1.2, the following will reduce impacts to a level that is less than significant.

The following mitigation measure(s) shall be implemented, subject to availability of NTC funding:

1. The initial briefing for soldiers who travel to Fort Irwin will include detailed information on both the hazards of performing desert maneuvers and the principles of desert survival. This briefing will cover geological, hydrological, biological, and climatic hazards, as well as hazards from wildfires. They will be briefed on earthquake safety prior to dispersing into the field for training maneuvers. A contingency plan will be developed to provide soldiers with guidelines on what to do following a major seismic event. Soldiers will be briefed on the dangers of flash floods and erosion hazards during and after heavy rainstorms.

2. To minimize the health risks of desert maneuvers, soldiers will be briefed on desert survival and the signs of heat stroke and heat exhaustion. Every soldier will be provided with adequate water during maneuvers and will be properly trained in first aid for heat exhaustion and heat stroke. In addition, adequate communications and rescue will be available for evacuating injured soldiers or those in distress from the extreme conditions of the desert.

3. Soldiers will be provided with adequate water and shade-producing devices in the event that they become separated from their unit or stranded in the desert. Roll call will be taken at the end of every day to ensure that no soldiers are missing from their training units. Soldiers will also be provided with flares or some other device that can be used to indicate where they are if they become stranded. Adequate communication devices will be available in the event that soldiers are discovered missing and to facilitate a rescue if necessary.

4. An earthquake contingency plan will be developed and implemented by the NTC that alerts soldiers to the risks associated with activities near utility corridors. In the event of an earthquake, all soldiers will take action to

retreat from areas near utility corridors until those areas have been determined safe.

5. Precautions will be taken to eliminate the possibility of collisions between military vehicles and utility towers. Maneuvers will be limited in the vicinity of the utility corridor. A restricted zone around the towers will be marked with flagging or some other obvious device. Soldiers will be provided with maps showing the exact locations of each of the towers and the associated restricted zones. In the event that heavy vehicles cross the utility corridor, reinforced crossings will be constructed to reduce the possibility of compromising underground gas pipelines. To reduce the potential collisions between military or civilian aircraft and utility lines or tower, all towers will be equipped with standard aviation red obstruction lights.

6. An electronic tracking system will be used to prevent inadvertent surface crossing of Highway 127.

Significant impacts will occur in the event of a collision between military vehicles and utility towers and if heavy military vehicles crossing utility corridors compromise underground natural gas pipelines. Implementation of mitigation measures, including restriction zones around towers and reinforced crossings, will reduce these impacts to less than significant. Implementation of an earthquake contingency plan will reduce impacts associated with activities near utility corridors during an earthquake to less than significant.

Impacts associated with stranded soldiers will be reduced to less than significant through survival training and provision of adequate water and shade-producing devices.

Health and safety impacts associated with State Highway 127 include reducing visibility from dust clouds, civilian drivers being distracted by nearby military maneuvers, and the potential for accidents between civilian and military vehicles. Implementation of mitigation measures will reduce these impacts to less than significant.

4.21.2 Modified Avawatz-Silurian Alternative

4.21.2.1 Impacts

This alternative has similar safety hazards as the Proposed Action. However, the risks associated with operation of military vehicles in existing utility corridors would be greatly decreased. This alternative does not cross any existing utility corridor except the transportation corridor at the southernmost portion boundary involving only 12 square miles of utility corridor. Because the transportation corridor will cross the electrical transmission lines and underground natural gas pipelines at two points, there is still potential for the safety impacts associated with military vehicles crossing the utility corridor. Implementation of the mitigation measures will reduce this impact to less than significant.

4.21.2.2 Mitigation

Mitigation Measures 1 through 6 described in the Proposed Action will also be implemented under the Modified Avawatz-Silurian Alternative.

4.21.3 Modified Coyote Basin Alternative

4.21.3.1 Impacts

Although most of the impacts are not considered significant, each of the proposed land expansion alternatives under consideration has an associated potential increased risk to health and safety. Measures have been incorporated to avoid or minimize potential safety hazards associated with the proposed land expansion. Potential safety hazards include seismic hazards posed by ground maneuvering in close proximity to overhead electric transmission lines and underground natural gas lines (113 square miles of utility corridor), potential safety threats to adjacent users should military equipment inadvertently exceed the boundaries, and increased air activity in the vicinity of overhead transmission lines.

An expansion of the NTC will change the existing boundaries. For the Modified Coyote Basin Alternative, the NTC will expand beyond the utility corridor. The rise of Lane Mountain will create an obvious topographic barrier at the expanded boundary to the southwest. For boundaries near Harvard, east of Superior Valley, and near Silver Dry Lake,

however, no obvious features will exist to assist soldiers in identification of bounds to their use. Because this alternative involves maneuvers on both sides of the Boulder Utility Corridor, there is an increased potential safety hazard posed to aircraft participating in the exercises. These increased health and safety risks could result in injuries to soldiers performing maneuvers or civilians using areas outside of the expanded boundaries. These impacts will be considered significant.

The impacts resulting from geological, hydrological, biological, and climatic hazards described under the Proposed Action will also be the same under the Modified Coyote Basin Alternative.

4.21.3.2 Mitigation

Mitigations 1 through 5 described in the Proposed Action will also be implemented under the Modified Coyote Basin Alternative.

4.21.4 Alvord Alternative

4.21.4.1 Impacts

This alternative has similar associated safety hazards as the Modified Coyote Basin Alternative, but an increased risk of military vehicle trespass on public and private lands may occur because the boundary near Coyote Lake and Harvard will be marked only by signs and not by obvious physical barriers. This alternative will involve 79 square miles of utility corridor.

4.21.4.2 Mitigation

Mitigation Measures 1 through 5 under the Proposed Action will be implemented to minimize potential safety hazards.

4.21.5 Superior Valley Alternative

4.21.5.1 Impacts

This alternative has similar associated safety hazards as the Modified Coyote Basin Alternative. The utility corridor forms a strong visual landmark that minimizes risks to adjacent users from military equipment exceeding the boundaries. This alternative will involve 42 square miles of utility corridor. Potential impacts on traffic safety are avoided due to adequate buffer area provided by this alternative.

4.21.5.2 Mitigation

Mitigations 1 through 5 described in the Proposed Action will be implemented under the Superior Valley Alternative.

4.21.6 Avawatz Alternative

4.21.6.1 Impacts

This alternative has potential safety hazards similar to the Superior Valley Alternative. This alternative will involve 30 square miles of utility corridor. The exception is the potential impact on adjacent users. Military equipment that strays beyond the boundaries will pose a safety hazard to adjacent users in Rainbow Basin and Superior Dry Lake. Those health and safety hazards described under the Modified Coyote Basin Alternative will also be expected to occur under the Avawatz Alternative.

4.21.6.2 Mitigation

Mitigation Measures 1 through 5 described under the Proposed Action will be implemented under the Avawatz Alternative.

4.21.7 No Action Alternative

4.21.7.1 Impacts

Under the No Action Alternative, there will be no planned maneuvers of military vehicles in any portion of the study area. Health and safety hazards will continue to result from the existing geological, hydrological, biological, and climatic conditions in the study area. Wildfires and the remoteness of the area will also continue to be a potential hazard for those humans who use the study area for recreational or other purposes. Based on the level of human use in the study area for mining and recreation, for example, the potential hazards may increase due to increased

usage of the area. If recreational or mining activities decrease, then the hazards may also decrease.

Seismic hazards will be expected to remain the same in the study area under the No Action Alternative. The risk to humans from earthquakes will always be present in such close proximity to the San Andreas fault zone. If the study area becomes populated with significantly more residences, then impacts from seismic events will be expected to increase in the study area.

The health and safety risks from electrical transmission lines and underground natural gas pipelines will remain the same under the No Action Alternative. A U.S. Air Force visual route and the civil air corridor currently parallel the Boulder Utility Corridor, and there are some existing potential risks posed to aircraft operating in the vicinity of overhead transmission lines. If additional utilities are installed within the utility corridors, the risks to humans and aircraft will probably increase somewhat.

Some parts of the existing boundary of the NTC are marked by obvious topographic and manmade features. The utility corridor to the east is a visible boundary marker, and the top of Alvord Mountain is an obvious topographic feature. However, it is not uncommon for incidences of military vehicle trespass to occur on public and private lands adjacent to the existing NTC. While this use is generally not intentional, these occurrences do create hazards for the public and private landowners near the installation boundary. The present NTC boundary is marked by signs alone; no fencing exists. Therefore, the risk to adjacent users of public and private lands will continue, particularly for persons using adjacent areas at night, when maneuvers often occur. In addition, the existing boundaries of the NTC are generally well known to the public and private land users adjacent to the NTC so that accidental trespass incidences of civilians on the NTC are rare.

4.21.8 Cumulative Impacts

Health and safety issues of the cumulative projects tend to be site specific and generally do not lead to a cumulative impact.

The Proposed Action and the MCAGCC vehicle corridor project would contribute to visibility impacts from windblown dust on Highway 127. This could result in a significant cumulative impact.

4.21.9 Summary of Impacts/Alternatives

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.21-1. A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.21-2.

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Table 4.21-1

HUMAN HEALTH AND SAFETY - SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Alternatives						
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Significant impact from potential safety hazards associated with military operations in 70 square miles of utility corridors and in proximity to Highway 127.	Significant impact from potential safety hazards associated with military operations in 12 square miles of utility corridors and in proximity to Highway 127.	Significant impact from potential safety hazards associated with military operations in 113 square miles of utility corridors.	Significant impact from potential safety hazards associated with military operations in 79 square miles of utility corridors.	Significant impact from potential safety hazards associated with military operations in 42 square miles of utility corridors.	Significant impact from potential safety hazards associated with military operations in 30 square miles of utility corridors.	No impact.

Table 4.21-2

HUMAN HEALTH AND SAFETY - SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Alternatives					
Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Impacts reduced to not significant.	Impacts reduced to not significant.	Impacts reduced to not significant.	Impacts reduced to not significant.	Impacts reduced to not significant.	Impacts reduced to not significant.

4.22 SUMMARY OF IMPACT ANALYSIS

A summary of the probable impacts of each expansion alternative carried forward for detailed study, as well as the No Action Alternative, is presented in Table 4.22-1. Table 4.22-2 lists the recommended mitigation measures for each alternative (subject to availability of funds). A summary of the probable residual impacts of each alternative after implementation of proposed mitigation measures is presented in Table 4.22-3.

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Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
GEOLOGY Landform/ Topography	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
SOILS	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 277,244 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 226,793 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 236,175 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 190,727 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 264,776 acres. Potential increase in soil erosion.	Impacts associated with soil disturbance from military vehicles. Heaviest vehicle use on 170,401 acres. Potential increase in soil erosion.	Current study area activities resulting in 95 acres of new soil disturbance.
	Potential impact on 2,470 acres of dry lakebeds.	Potential impact on 2,470 acres of dry lakebeds.	Potential impact on 5,469 acres of dry lakebeds.	Potential impact on 200 acres of dry lakebeds.	Potential impact on 8,400 acres of dry lakebeds.	Potential impact on 6,800 acres of dry lakebeds.	No change in current BLM multiple-use management.
WATER RESOURCES Groundwater	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
Surface Water	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	Potential impacts associated with springs, vehicle operation in natural drainage systems, and increased erosion patterns.	No impacts.

Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
BIOLOGICAL RESOURCES Plant Habitat	Potential impact on 331,217 acres of native Mojave Desert vegetation. Loss of 2,845 acres of Joshua tree woodland and 9,707 acres of desert sand fields and dunes. Potential impacts on springs.	Potential impact on 270,030 acres of native Mojave Desert vegetation. Loss of 2,700 acres of Joshua tree woodland and 6,330 acres of desert sand fields and dunes. Potential impacts on springs.	Potential impact on 259,470 acres of native Mojave Desert vegetation. Loss of 741 acres of Joshua tree woodland/Mojave woody scrub mix. Potential impacts on springs.	Potential impact on 210,800 acres of native Mojave Desert vegetation. Potential impacts on springs.	Potential impact on 284,885 acres of native Mojave Desert vegetation. Loss of 4,376 acres of Joshua tree woodland. Potential impacts on springs.	Potential impact on 185,500 acres of native Mojave Desert vegetation.	No change in current BLM multiple-use management.
Sensitive Plant Species	Potential impacts on one Federal Species of Concern (FSOC) species and several sensitive species.	Potential impacts on one FSOC and several sensitive species.	Impacts on one proposed listed endangered species, one FSOC, and one sensitive species.	Impacts on one proposed listed endangered species and one FSOC.	Impacts on one proposed listed endangered species and two FSOC.	Impacts on one proposed listed endangered species, one FSOC, and one sensitive species.	Potential impact on one proposed listed plant species and several sensitive plant species. No change in current BLM multiple-use management.

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Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Wildlife Habitat	Loss of or disturbance to 272,780 acres of valuable wildlife habitat, including the Salt Creek riparian habitat, Sheep Creek Springs, Owl Hole Springs, and the tributaries of the Amargosa River. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Loss of or disturbance to 222,163 acres of valuable wildlife habitat, including Sheep Creek, Owl Hole Springs, and the tributaries of the Amargosa River. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Impact on 234,136 acres of valuable wildlife habitat, including Paradise Springs, Jack Springs, Jackrabbit Springs, the slopes of Alvord and Soda Mountains, and active dune systems in the vicinity of the Soda Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Impact on 190,727 acres of valuable wildlife habitat, including the slopes of Alvord and Soda Mountains and active dune systems in the vicinity of the Soda Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors.	Impact on 241,392 acres of valuable wildlife habitat in parts of the Coyote Basin eastward into low-relief lands south of the Avawatz Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	Impact on 164,048 acres of valuable wildlife habitat in parts of the Goldwater Range and Coyote Basin eastward into low-relief lands east of the Avawatz Mountains. Impacts on resident and migratory wildlife and wildlife movement corridors. Impacts on sensitive wildlife resources.	No change in current BLM multiple-use management.
Sensitive Wildlife Species Desert Tortoise	Substantial loss of low to moderate desert tortoise habitat within the Silurian Hills, Valjean Valley, and Soda Mountains. Impact on tortoise populations.	Substantial loss of low to moderate desert tortoise habitat within the Silurian Hills and Valjean Valley. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat within the North Alvord Slope, Southwest Coyote Basin, east of Lane Mountain, and west of Cronese Mountains. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat within Superior Valley and west of Cronese Mountains. Impact on tortoise populations.	Substantial loss of moderate to high desert tortoise habitat. Impact on tortoise populations.	Potential impacts on desert tortoise. No change in current BLM multiple-use management.

Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Other Sensitive Species	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, Gila woodpecker, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, Gila woodpecker, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including the chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, Mojave fringe-toed lizard, burrowing owl, bats, badger, and Nelson's bighorn sheep.	Potential impacts on other sensitive species, including Mohave ground squirrel, chuckwalla, burrowing owl, bats, badger, and Nelson's bighorn sheep.	No change in current BLM multiple-use management.
CULTURAL RESOURCES Prehistoric	Seventy-four known area sites; many potentially eligible for National Register of Historic Places (NRHP). Could impact NRHP sites.	Seventy-two known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred eighty known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred thirty-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred nine known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	No change in current BLM multiple-use management.
Historic	Thirty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Twenty-three known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Ninety-four known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Thirty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	One hundred sixty-seven known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	Fifty-six known area sites; many potentially eligible for NRHP. Could impact NRHP sites.	No change in current BLM multiple-use management.
PALEONTOLOGICAL Paleontological Deposits	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	Potential impact on paleontological deposits lying beneath visible ground surface.	No change in current BLM multiple-use management.

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SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
AIR QUALITY	Potential reduction in dust emission; less 200 tons per year PM-10 particulates. Visibility impact on Highway 127.	Potential reduction in dust emission; less 200 tons per year PM-10 particulates. Visibility impact on Highway 127.	Increase in dust emission; addition of 579 tons per year PM-10 particulates.	Increase in dust emission; addition of 263 tons per year PM-10 particulates.	Increase in dust emission; addition of 579 tons per year PM-10 particulates.	Increase in dust emission; addition of 263 tons per year PM-10 particulates.	No impacts. No change to existing emissions.
NOISE	No impacts.	No impacts.	Potential noise impact from aircraft to receptors in Harvard.	Potential noise impact from aircraft to receptors in Harvard.	Potential noise impact from aircraft to receptors in Harvard.	Potential noise impact from aircraft to receptors in Harvard.	No change in current BLM multiple-use management.
LAND USE Current Land Ownership	Acquisition of 310,296 acres public lands, 5,148 acres private lands, and 15,773 acres state lands for military use.	Acquisition of 253,300 acres public lands, 4,380 acres private lands, and 12,350 acres state lands for military use.	Acquisition of 196,914 acres public lands, 57,811 acres private lands, and 4,745 acres state lands for military use.	Acquisition of 168,700 acres public lands, 37,300 acres private lands, and 4,800 acres state lands for military use.	Acquisition of 202,254 acres public lands, 79,300 acres private lands, and 3,331 acres state lands for military use.	Acquisition of 137,600 acres public lands, 45,900 acres private lands, and 2,000 acres state lands for military use.	No change.
Existing Land Use Classifications	Military operations inconsistent with existing BLM multiple-use areas and Salt Creek Hills and Denning Springs ACECs, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas and crucifixion thorn assemblage unusual plant assemblage (UPA), resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas and crucifixion thorn assemblage UPA, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in an impact.	Military operations inconsistent with existing BLM multiple-use areas, resulting in an impact.	No change in current BLM multiple-use management.

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SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Grazing and Western Mojave Land Tenure Adjustment Program	Impact from loss of 29,200 grazing acres.	Impact from loss of 490 grazing acres.	Impact from loss of 97,746 grazing acres and reduction of 50,560 acres of private land in the Western Mojave Land Tenure area.	Impact from loss of 69,586 grazing acres and reduction of 35,840 acres of private land in the Western Mojave Land Tenure area.	Impact from loss of 118,106 grazing acres and reduction of 151,680 acres of private land in the Western Mojave Land Tenure area.	Impact from loss of 41,606 grazing acres and reduction of 51,840 acres of private land in the Western Mojave Land Tenure area.	No change in current BLM multiple-use management.
RECREATION Land Sailing	Impact from loss of opportunity to use Silurian Dry Lake.	Impact from loss of opportunity to use Silurian Dry Lake.	No impacts.	No impacts.	Impact from loss of opportunity to use Superior Dry Lake 1.	No impacts.	No change in current BLM multiple-use management.
Rock Hounding	Impact from loss of opportunity to use Avawatz Mountains.	Impact from loss of opportunity to use Avawatz Mountains.	Impact from loss of opportunity to use, South Avawatz Mountains, Alvord Mountain, and Spanish Canyon.	Impact from loss of opportunity to use Alvord Mountain and Spanish Canyon.	Impact from loss of opportunity to use Lane Mountain, Alvord Mountain, and Spanish Canyon.	Impact from loss of opportunity to use Alvord Mountain and Spanish Canyon.	No change in current BLM multiple-use management.
Sightseeing and Camping	Impact from loss of opportunity to use 310,296 acres of public lands.	Impact from loss of opportunity to use 253,300 acres of public lands.	Impact from loss of opportunity to use 196,914 acres of public lands, including Spanish Canyon and Paradise Springs camp areas.	Impact from loss of opportunity to use 168,700 acres of public lands, including Spanish Canyon camp area.	Impact from loss of opportunity to use 202,254 acres of public lands, including Spanish Canyon and Paradise Springs camp areas.	Impact from loss of opportunity to use 137,600 acres of public lands, including Paradise Springs camp areas.	No change in current BLM multiple-use management.

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SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Off-Highway Vehicle (OHV) Use	Impact from restricted use of 35 miles of maintenance road and several trails.	Impact from restricted use of 5.5 miles of maintenance road and several trails.	Impact from restricted use of 136 miles of trail, including 35.5 miles of maintenance road.	Impact from restricted use of 136 miles of trail, including 35.5 miles of maintenance road.	Impact from restricted use of Superior Valley area and 100 miles of trail.	Impact from restricted use of 100 miles of trail.	No change in current BLM multiple-use management.
Horseback Riding	No impacts.	No impacts.	Impact from losing use of a portion of Superior Valley.	No impacts.	Impact from losing use of northern end of Mud Hills, Lane Mountain, Spanish Canyon, and Paradise Valley.	No impacts.	No impacts.
Hunting and Shooting	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
MINING Impacts from potential jobs lost	Potential impacts from loss of jobs. Small production level - 682 jobs to large production level - 3,247 jobs.	Potential impacts from loss of jobs. Small production level - 682 jobs to large production level - 3,247 jobs.	Potential impacts from loss of jobs. Small production level - 796 jobs to large production level - 3,625 jobs.	Potential impacts from loss of jobs. Small production level - 796 jobs to large production level - 3,625 jobs.	Potential impacts from loss of jobs. Small production level - 796 jobs to large production level - 3,625 jobs.	Potential impacts from loss of jobs. Small production level - 682 jobs to large production level - 3,247 jobs.	No change from current conditions.
Impacts from potential taxes lost	Potential impacts from lost taxes. Small production level - $836,000 to large production level - $10,343,000.	Potential impacts from lost taxes. Small production level - $836,000 to large production level - $10,343,000.	Potential impacts from lost taxes. Small production level - $909,000 to large production level - $10,679,000.	Potential impacts from lost taxes. Small production level - $909,000 to large production level - $10,679,000.	Potential impacts from lost taxes. Small production level - $909,000 to large production level - $10,679,000.	Potential impacts from lost taxes. Small production level - $836,000 to large production level - $10,343,000.	No change from current conditions.

Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
Impacts from cost of mine purchase per year	Potential impacts from loss of mine purchase per year. Small production level - $10,561,000 to large production level - $95,960,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,561,000 to large production level - $95,960,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,977,000 to large production level - $97,667,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,977,000 to large production level - $97,667,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,977,000 to large production level - $97,667,000.	Potential impacts from loss of mine purchase per year. Small production level - $10,561,000 to large production level - $95,960,000.	No change from current conditions.
UTILITY CORRIDORS	Potential impact on 70 square miles of utility corridor.	Potential impact on 12 square miles of utility corridor.	Potential impact on 113 square miles of utility corridor.	Potential impact on 79 square miles of utility corridor.	Potential impact on 42 square miles of utility corridor.	Potential impact on 30 square miles of utility corridor.	No change from current conditions.
TRANSPORTATION	Potential impacts on I-15 and Highway 127 due to dust generation. Restricted access to Silver Lake Road, Saratoga Springs Road, and Old Railroad Road.	Potential impact on Highway 127 due to dust generation. Restricted access to Silver Lake Road, Saratoga Springs Road, and Old Railroad Road.	Restricted access to Alvord Mountain and Coyote Lake Roads. Impact on I-15 due to dust generation.	Restricted access to Alvord Mountain and Coyote Lake Roads. Impact on I-15 due to dust generation.	Restricted access to Copper City Mine Road and Superior Lake. Restricted access to Alvord Mountain and Coyote Lake Roads.	Restricted access to Alvord Mountain and Coyote Lake Roads.	No impacts.
SOCIOECONOMICS	Loss of $17,400 from county property tax revenues.	Loss of $14,800 from county property tax revenues.	Loss of $214,200 from county property tax revenues.	Loss of $143,900 from county property tax revenues.	Loss of $286,800 from county property tax revenues.	Loss of $173,900 from county property tax revenues.	No impacts.
EDUCATION AND RESEARCH	Impacts from restricted use of research areas - Sheep Creek Springs, Silurian Hills Geologic Study Area, areas of Soda Mountains and West Cronese Basin.	Impacts from restricted use of access to research areas - Sheep Creek Springs, areas of Soda Mountains and West Cronese Basin.	Impacts from restricted use of access to research areas - Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, and Calico Mountains.	Impacts from restricted use of access to research areas - Soda Mountains, Alvord Mountain, Spanish Canyon, and West Cronese Basin.	Impacts from restricted use of access to research areas - Alvord Mountain, Spanish Canyon, Calico Mountains, and Mud Hills.	Impacts from restricted use of access to research areas - Soda Mountains, Alvord Mountain, Spanish Canyon, West Cronese Basin, and Calico Mountains.	No impacts.

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Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
WILDERNESS CHARACTERISTICS Potential impact on loss of wilderness values in WSAs	Impacts on Avawatz Mountains, South Avawatz Mountains, Kingston Range, and Soda Mountains WSAs.	Impacts on Avawatz Mountains, South Avawatz Mountains, and Kingston Range WSAs.	Impacts on South Avawatz Mountains, Soda Mountains, and Avawatz Mountains WSAs.	Impacts on South Avawatz Mountains, Soda Mountains, and Avawatz Mountains WSAs.	Impacts on South Avawatz Mountains and Avawatz Mountains WSAs.	Impacts on South Avawatz Mountains and Avawatz Mountains WSAs.	No impacts.
AIRSPACE	Army will replace three USAF contact points. No impacts are expected.	Army will replace three USAF contact points. No impacts are expected.	Army will replace three USAF contact points. Impacts from restricted use of USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain following route, and Ventura holding point.	Army will replace three USAF contact points. No impacts are expected.	Army will replace two USAF contact points. Impacts from restricted use on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain following route, and Ventura holding point.	Army will replace two USAF contact points. Impacts from curtailed use on USAF's Cords Road Area, Black Mountain Supersonic Corridor, and Black Mountain following route.	No impacts.
AESTHETIC RESOURCES	Impact on views along Highway 127.	Impact on views along Highway 127.	Impact on views along I-15.	Impact on views along I-15.	Impact if actions involve Lane Mountain.	No impacts expected.	No impacts.
SOLID WASTE AND HAZARDOUS SUBSTANCES	No impacts expected.	No impacts expected.	No impacts expected.	No impacts expected.	No impacts expected.	No impacts expected.	No impacts.

Table 4.22-1

SUMMARY AND COMPARISON OF ENVIRONMENTAL EFFECTS

Issue	Alternatives						
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**	**No Action**
HUMAN AND HEALTH SAFETY	Impacts from potential safety hazards associated with military operations in 70 square miles of utility corridors and in proximity to Highway 127.	Impacts from potential safety hazards associated with military operations in 12 square miles of utility corridors and in proximity to Highway 127.	Impacts from potential safety hazards associated with military operations in 113 square miles of utility corridors.	Impacts from potential safety hazards associated with military operations in 79 square miles of utility corridors.	Impacts from potential safety hazards associated with military operations in 42 square miles of utility corridors.	Impacts from potential safety hazards associated with military operations in 30 square miles of utility corridors.	No impacts.

Table 4.22-2

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Geology	No significant impacts are expected. No mitigation is required.
Soils	Lakebeds in the acquisition area shall be marked off limits on training maps. The lakebed areas shall be marked as hazards during exercises.
Water Resources	Direct access to springs identified for this alternative shall be restricted by posting signs and installing fencing and/or metal crossbars to prohibit encroachment. Field personnel shall avoid springs and riparian areas. Staff shall be briefed prior to exercises, and appropriate signage and fencing shall be used. Once installed, post instrumentation and communication systems shall be used during military exercises to track and direct vehicles away from spring areas.
Biological Resources	Foot traffic in areas with a slope of more than 20 percent shall avoid repeated disturbance to the same area whenever possible. Dunes in the northeast portion of the alternative shall be placed off limits to military maneuvers. Construction of new roads shall avoid sensitive vegetation communities wherever possible. A buffer zone, at a width to be established in consultation with the appropriate resource agency, shall be established between sensitive communities and roads. The 10 springs in the Avawatz region in the Silurian Valley shall be off limits. Access to the Salt Creek riparian habitat, Sheep Creek, Owl Hole Spring, and the tributaries of the Amargosa River shall be restricted. Per the Biological Opinion, tortoise-proof fencing shall be placed along the boundary of the training area, as shown on Figure 4.5-1, southeast of the geological feature known as "the whale." Identified tortoise populations of greater than 20 tortoises/square mile shall be protected with a 1-kilometer buffer zone. This buffer zone shall be enforced using signage and available technology used by the Army. The NTC shall initiate efforts to take an active role in the recovery of the desert tortoise. Participation in planning efforts for the West Mojave Coordinated Management Plan could constitute a means of undertaking such recovery efforts. Hunting and fishing shall not be allowed within any acquisition areas. The NTC shall continue to support the ongoing Juvenile Tortoise Research Project (JTREP) on the installation subject to availability of funding and in consultation with USFWS. The NTC shall monitor all fencing and off-limits areas. The existing NTC desert ecology/desert tortoise education program shall be expanded to increase awareness of desert ecology and the importance of eliminating adverse yimpacts on tortoises and other sensitive species found on the base and within the expansion area. This program shall continue to be provided to soldiers, family members, and rotational units, and shall be expanded to include the NTC contract and government workforce, especially those who work on the ranges. Soldiers permanently stationed at the NTC shall attend a formal briefing on tortoises, other sensitive species, and locations of protected areas. Rotational units shall continue to be informed on desert ecology and sensitive species upon arrival at NTC and prior to their field exercises.

Table 4.22-2

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Biological Resources (Continued)	An educational video shall be prepared to be shown at appropriate briefings and made available to other groups on Fort Irwin (i.e., Boy/Girl Scouts, Officer and Civilian Wives Club, and unit spouse groups). A presentation for school children shall occur at on-base schools each school year. Additional forms of educational distribution shall include informational bulletins and signs, educational notices in the post newspaper, and broadcasting on the post information channel. Caves and mineshafts shall be placed off limits. Nelson's bighorn sheep habitat shall be conserved, and any human-induced barriers to bighorn sheep movement shall be minimized. All potential water sources for this species shall be preserved.
Cultural	Section 106 consultation shall be required for formal determination of NRHP eligibility for all sites in this alternative. Formal eligibility can only be determined in consultation with the State Historic Reservation Officer (SHPO). Additional mitigation measures for potential adverse effects on cultural resources shall be formulated after eligibility determinations are concluded. A Programmatic Agreement (PA) between the Army, the California SHPO, and the Advisory Council on Historic Preservation shall be instituted to determine the program for treatment of cultural resources.
Paleontology	The NTC shall implement a continuing program of resource identification. If fossil deposits are located, they shall be evaluated to determine the effect of training activities and the feasibility of avoidance. If avoidance is not possible, the sites shall be mapped, and data shall be recovered and then curated at an appropriate institution. A standard paleontologic resource impact mitigation program must be developed in accordance with the (California Environmental Quality Act (CEQA) guidelines and the Society of Vertebrate Paleontology.
Air Quality	The NTC shall implement dust control measures, including the use of snow fencing, vegetation, and safety hazard signs. Dust control measures such as regular watering, chemical treatment, and an asphalt chip sealer shall be used in primary dust generation areas.
Noise	No significant impacts have been identified, and no mitigation is necessary. However, should any existing residents located in proximity to the boundary of the acquisition area experience excessive noise levels, the Army is committed to, on a case-by-case basis, respond to any complaints of noise by monitoring noise levels and taking appropriate remedial action in accordance with Army Regulation (AR) 200-1.
Land Use	A public access policy shall be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area as is presently done on the existing NTC. Access shall also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, OHVs, etc.
Recreation	A public access policy shall be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area as is presently done on the existing NTC. Access shall also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, OHVs, etc.

Table 4.22-2

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Mining	Valid mineral interests within the proposed withdrawal shall be considered for acquisition except those mining and exploratory operations ongoing at the time of the withdrawal that the Army has determined shall not interfere with the NTC mission. Mineral resource development and mineral surface activity within the withdrawal on mining claims with valid existing rights, leases, contracts, or permits on federal land shall be managed under the authority of the Secretary of the Interior by the BLM (43 U.S.C. 158). Regulations in Title 43 CFR 3809 shall be used to implement the BLM's surface management and reclamation oversight responsibilities on unpatented mining claims. Authority also exists for BLM management of leasable and salable mineral resources under the same title. Private mineral interests within the preferred alternative shall be purchased by the Army under appropriate acquisition authority. Mineral lands acquired by the Army shall not be considered public lands included in the proposed withdrawal but could be made available for mineral leasing under enabling legislation sought by BLM and the NTC. The threshold for determining whether mineral activity shall be allowed shall be based on an evaluation of mission and environmental compatibility in accordance with specific legislation authorizing the withdrawal. If in the future the U.S. Army determines that withdrawn lands are no longer needed and/or that mineral development shall not affect the mission of the NTC, development of hardrock mineral interests [minerals subject to location or sale as defined in the regulations at 43 CFR 3500.05 (n)] acquired by the Army shall be available under appropriate mineral law administered by the BLM after such lands either reverted back to the public domain or determined to be available for exploration or development under the pilot leasing program sought by the BLM and the NTC. Mineral development proposals on unpatented mining claims that have not exhibited ongoing mineral development activity as of the date of the withdrawal shall be examined to determine if they have valid existing rights (VERs). Those that do not shall be contested; those unpatented claims that do have VERs shall be acquired by the Army. The NTC may consent to the development of a VER on a case-by-case basis, having first determined that such development shall not interfere with the NTC mission. Any permitted development shall be in accordance with appropriate BLM regulations and under restrictions protecting the NTC mission. Just compensation for any decrease in the value of VERs shall be paid by the Army. Private mineral interests acquired by the Army may be available for permit, lease, and development of coal, phosphate, oil, oil shale, gilsonite (including vein-type solid hydrocarbons), gas, sodium, potassium, and sulfur under the authority of the Acquired Lands Leasing Act of August 7, 1947 (30 U.S.C. 351,352). Applications for the above minerals shall be reviewed by the Army to assure that such lease shall be consistent with the purpose and intent of the NTC. Permits and leases shall be administered by the BLM and subject to such stipulations ensuring that the mission of the NTC shall not be affected. Development of hardrock mineral interests (minerals subject to location or sale as defined in the regulations at 43 CFR 3500.05[n]) acquired by the Army shall be authorized under appropriate mineral law administered by the BLM after such lands revert to the public domain pursuant to a determination by the U.S. Army that the withdrawn lands are no longer needed and that mineral development shall not affect the mission of the NTC, or under a pilot leasing program pursuant to special legislation sought by the BLM and the NTC.

Table 4.22-2

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Mining (Continued)	The area proposed for withdrawal shall be reviewed for the appropriateness of segregation from entry under the mining laws every 5 years following the effective date of the withdrawal. Such review shall be in accordance with the procedures and requirements of Section 204 of the Federal Land Policy and Management Act (FLPMA). Post-withdrawal mineral authorizations, leases, permits, contracts, or locations could be allowed. Any authorization shall require specific legislation allowing for such use and shall be limited to the provisions of existing statutes (43 U.S.C. 158). All use approvals shall be managed by the BLM in accordance with existing laws and regulations. Any use authorizations shall be subject to the concurrence of the NTC, and post-authorization exploration or mining plans of operation shall have to be conducted in such a manner as not to adversely affect the purpose of the NTC expansion and mission of the NTC.
Utility Corridors	The NTC shall establish a 24-hour staff to coordinate utility company access for maintenance, inspection, and repair. The NTC shall restrict use of existing service roads to utility company maintenance personnel only. Crossing areas shall be established that adhere to the following criteria: (1) the crossing area shall, when possible, be at a midway point between the towers, (2) protective barriers shall be erected or permanently installed in areas where bottlenecking of vehicles occurs prior to or after crossing to prevent tracked vehicles from colliding with adjacent transmission towers, (3) engagements with the opposing force regiment (OPFOR) shall be restricted from occurring within 3 miles from the transmission lines, and (4) the crossing area shall be excavated below grade to assure the necessary clearance between the booms of the tracked towing vehicles and the conductor lines. Flight markers shall be installed on the outside conductor lines. Rotary-winged aircraft shall be restricted to designated air sectors away from transmission lines. To mitigate conflicts between utility company and military rotary-winged aircraft, the utility company shall schedule its maintenance flyovers with the point of contact (POC) at the NTC. WILLTEL fiber-optic cable shall be protected by either an underground encasement for fiber-optic cable to pass through and/or deeper burial depth at the designated crossing points. The natural gas pipeline shall be marked sufficiently along its route and especially in the crossing areas to indicate its location and provide a warning not to dig in the vicinity. The two block-valve locations for the pipeline shall be protected by installing concrete bollards or steel pipes with suitable footings around the existing chainlink perimeter fence. Reflectors shall be installed on each fence.
Transportation and Access	No significant impacts are expected.
Socioeconomics	No significant impacts are expected.

Table 4.22-2

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Education and Research	A public access policy shall be prepared to provide access guidelines for educational institutions, the scientific community, and other interested groups in accordance with the military training schedule. The access policy would provide for guided tours of historical, cultural, and biological resources within the expansion area, as is presently done on the existing NTC. Access shall also be made available to the scientific community for research activities. It should be noted that the public access policy is not envisioned to provide access for recreational uses such as land sailing, hunting, OHV, etc. The Army shall develop a cooperative agreement with the California State University System/Desert Studies Consortium to arrange access to and use of the existing research facility at Sheep Creek Springs.
Wilderness Characteristics	Access routes into wilderness areas from the NTC shall be gated and posted with signs stating "You are entering a wilderness area. No motorized vehicles allowed."
Airspace	No significant impacts are expected.
Aesthetics	To the extent possible, new roadways and undercrossings shall be designed to blend into the surrounding landscape.
Solid Waste and Hazardous Substances	No significant impacts are expected.
Health and Safety	The initial briefing for soldiers who travel to Fort Irwin shall include detailed information on both the hazards of performing desert maneuvers and the principles of desert survival. This briefing shall cover geological, hydrological, biological, and climatic hazards, as well as hazards from wildfires. They shall be briefed on earthquake safety prior to dispersing into the field for training maneuvers. A contingency plan shall be developed to provide soldiers with guidelines on what to do following a major seismic event. Soldiers shall be briefed on the dangers of flash floods and erosion hazards during and after heavy rainstorms. To minimize the health risks of desert maneuvers, soldiers shall be briefed on desert survival and the signs of heat stroke and heat exhaustion. Every soldier shall be provided with adequate water during maneuvers and shall be properly trained in first aid for heat exhaustion and heat stroke. In addition, adequate communications and rescue shall be available for evacuating injured soldiers or those in distress from the extreme conditions of the desert. Soldiers shall be provided with adequate water and shade-producing devices in the event that they become separated from their unit or stranded in the desert. Roll call shall be taken at the end of every day to ensure that no soldiers are missing from their training units. Soldiers shall also be provided with flares or some other device that can be used to indicate where they are if they become stranded. Adequate communication devices shall be available in the event that soldiers are discovered missing and to facilitate a rescue if necessary. An earthquake contingency plan shall be developed and implemented by the NTC that alerts soldiers to the risks associated with activities near utility corridors. In the event of an earthquake, all troops shall take action to retreat from areas near utility corridors until those areas have been determined safe.

Table 4.22-2

ARMY ENVIRONMENTAL COMMITMENTS AS PART OF THE PROPOSED ACTION

Element	Commitment
Health and Safety (Continued)	Precautions shall be taken to eliminate the possibility of collisions between military vehicles and utility towers. If possible, maneuvers shall be limited in the vicinity of the utility corridor. Large boulders that shall prevent the passage of tracked and wheeled vehicles shall be placed around the base of each of the towers. A restricted zone around the towers shall be marked with flagging or some other obvious device. Soldiers shall be provided with maps showing the exact locations of each of the towers and the associated restricted zones. In the event that heavy vehicles cross the utility corridor, reinforced crossings shall be constructed to reduce the possibility of compromising underground gas pipelines. Helicopter flight routes to access the acquisition areas shall be established to avoid the utility corridors. An electronic tracking system shall be used to prevent inadvertent surface crossing of Highway 127.

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Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
GEOLOGY Landform/ Topography	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
SOILS Significant adverse impacts associated with soil disturbance from military vehicles	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.	No known mitigation; unavoidable significant impact remains.
Potential significant impacts from disturbance to dry lakebeds	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.	Military vehicles restricted from dry lakebeds. Impact reduced to not significant.
WATER RESOURCES Groundwater	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
Surface Water	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.

Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
BIOLOGICAL RESOURCES Plant Habitat	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Significant impacts on Joshua tree woodland and desert sand fields and dunes. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Significant impacts on Joshua tree woodland and desert sand fields and dunes. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Impacts on Joshua tree woodland. Military vehicles restricted from springs. No significant impacts are expected. No mitigation is required.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling.	Significant impact on native Mojave Desert vegetation, including a large impact on the Joshua tree woodland community. Military vehicles restricted from springs; impacts reduced to not significant.	Significant impact on native Mojave Desert vegetation due to disturbance and trampling. Military vehicles restricted from springs; impacts reduced to not significant.
Sensitive Plant Species	Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Military vehicles will be restricted from springs. No significant impacts are expected. No mitigation is required.	Impacts on the FSOCs and sensitive species are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Military vehicles will be restricted from springs. Impacts on the FSOCs are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Impacts on two FSOCs are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.	Impacts on the FSOCs and sensitive species are not significant after mitigation. Impacts on the proposed listed endangered species remain significant after mitigation.
Wildlife Habitat	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.	Significant impacts on wildlife habitat and movement corridors. No known mitigation; unavoidable significant impact remains. Impacts on sensitive wildlife resources are not significant after mitigation.

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Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
Sensitive Wildlife Species Desert Tortoise	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
Other Sensitive Species	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on any potential or existing badger habitat and movement corridors of the Nelson's bighorn sheep. Significant impacts on Nelson's bighorn sheep unmitigable.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.	Significant impact on existing habitat for sensitive species, including the Mohave ground squirrel. Impacts on Nelson's bighorn sheep movement corridors. Significant impacts on Nelson's bighorn sheep unmitigable. Impacts on Mohave ground squirrel not significant after mitigation.

Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
CULTURAL RESOURCES Prehistoric - could impact potential NRHP site	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
Historic - could impact potential NRHP site	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
PALEONTOLOGICAL Could impact subsurface paleontological deposits	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
AIR QUALITY	Visibility impacts on Highway 127 reduced to not significant.	Visibility impacts on Highway 127 reduced to no significant.	Dust emission impact remains significant.	Dust emission impact remains significant.	Dust emission impact remains significant.	Dust emission impact remains significant.
NOISE	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.
LAND USE Multiple-Use Areas	Impacts on existing BLM multiple-use areas and ACECs remain significant.	Impacts on existing BLM multiple-use areas remain significant.	Impacts on existing BLM multiple-use areas and UPA remain significant.	Impacts on existing BLM multiple-use areas and UPA remain significant.	Impacts on existing BLM multiple-use areas remain significant.	Impacts on existing BLM multiple-use areas remain significant.
Grazing	Loss of 29,200 grazing acres remains significant. No mitigation is required.	Impacts of the loss of 490 grazing acres remain less than significant.	Loss of 60,846 grazing acres and reduction of 50,560 acres of private land in the Western Mojave Land Tenure area remain significant.	Loss of 69,586 grazing acres and reduction of 35,840 acres of private land in the Western Mojave Land Tenure area remain significant.	Loss of 118,106 grazing acres and reduction of 151,680 acres of private land in the Western Mojave Land Tenure area remain significant.	Loss of 41,606 grazing acres and reduction of 51,840 acres of private land in the Western Mojave Land Tenure area remain significant.

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Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
RECREATION						
Land Sailing	Impact remains the same.	Impact remains the same.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains significant.	No significant impacts are expected. No mitigation is required.
Rock Hounding	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Sightseeing and Camping	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
OHV Use	Impact remains the same.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Horseback Riding	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact remains the same.	No significant impacts are expected. No mitigation is required.
Hunting and Shooting	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
MINING						
Impact from potential jobs lost	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Significant impact from potential taxes lost	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
Significant impact from cost of mine purchase per year	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.	Impact remains the same.
UTILITY CORRIDORS	Impacts on 70 square miles of utility corridor remain the same.	Impacts on 12 square miles of utility corridor remain the same.	Impacts on 113 square miles of utility corridor remain the same.	Impacts on 79 square miles of utility corridor remain the same.	Impacts on 42 square miles of utility corridor remain the same.	Impacts on 30 square miles of utility corridor remain the same.

Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
TRANSPORTATION	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	Impacts not significant after mitigation.	No significant impacts are expected. No mitigation is required.
SOCIOECONOMICS	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.
EDUCATION AND RESEARCH	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.	Impact from restricted use of research areas remains significant.
WILDERNESS CHARACTERISTICS Potential significant impact on wilderness values of WSAs	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.	Impact remains significant.
AIR SPACE	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point reduced to not significant.	No significant impacts are expected. No mitigation is required.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point reduced to not significant.	Impact on USAF's Cords Road Area, Black Mountain Supersonic Corridor, Black Mountain Terrain Following Route, and Ventura Holding Point reduced to not significant.
AESTHETIC RESOURCES	Impact on views along Highway 127 remains significant.	Impact on views along Highway 127 remains significant.	Impact on views along I-15 remains significant.	Impact on views along I-15 remains significant.	Impacts on views of Lane Mountain reduced to not significant.	No significant impacts are expected. No mitigation is required.
SOLID AND HAZARDOUS WASTE	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.	No significant impacts are expected. No mitigation is required.

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Table 4.22-3

SUMMARY OF ENVIRONMENTAL EFFECTS AFTER MITIGATION

Issue	Alternatives					
	Proposed Action (Silurian Valley)	**Modified Avawatz-Silurian**	**Modified Coyote Basin**	**Alvord**	**Superior Valley**	**Avawatz**
HUMAN AND HEALTH SAFETY Potential safety hazards from military operations in utility corridors and in close proximity to highways	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.	Impact reduced to not significant.

SECTION 5 - RELATIONSHIP BETWEEN SHORT-TERM USES OF ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

5.1 PROPOSED ACTION (SILURIAN VALLEY) ALTERNATIVE

The Proposed Action will involve tradeoffs between long-term productivity and short-term uses of the environment.

The Proposed Action would support the training mission of the NTC by providing sufficient area and facilities to train troops in realistic combat situations. However, natural open space land will decrease. The withdrawal of 310,296 acres of public lands for military use will reduce the amount of BLM multiple use area available for recreation, grazing, mining, and research. In addition, 331,217 acres of native vegetation and wildlife habitat may potentially be disturbed.

Implementation of the Proposed Action would result in short-term impacts on the physical and manmade environments. However, the Proposed Action conforms to short-term uses by supporting the NTC's training activities. In the long term, the Proposed Action will maintain and enhance training productivity through the efficient use and expansion of existing training facilities.

5.2 MODIFIED AVAWATZ-SILURIAN ALTERNATIVE

The Modified Avawatz-Silurian Alternative will involve the same tradeoffs between long-term productivity and short-term uses of the environment as the Proposed Action. However, this alternative will involve 253,300 acres of public lands and 270,030 acres of native vegetation and wildlife habitat.

5.3 MODIFIED COYOTE BASIN ALTERNATIVE

The Modified Coyote Basin Alternative will involve the same tradeoffs between long-term productivity and short-term uses of the environment as the Proposed Action. However, this alternative will involve 196,914 acres of public lands and 259,470 acres of native vegetation and wildlife habitat.

5.4 ALVORD ALTERNATIVE

The Alvord Alternative will involve the same tradeoffs between long-term productivity and short-term uses of the environment as the Proposed Action. However, this alternative will involve 168,700 acres of public lands and 210,800 acres of native vegetation and wildlife habitat.

5.5 SUPERIOR VALLEY ALTERNATIVE

The Superior Valley Alternative will involve the same tradeoffs between long-term productivity and short-term uses of the environment as the Proposed Action. However, this alternative will involve 202,254 acres of public lands and 284,885 acres of native vegetation and wildlife habitat.

5.6 AVAWATZ MOUNTAINS ALTERNATIVE

The Avawatz Mountains Alternative will involve the same tradeoffs between long-term productivity and short-term uses of the environment as the Proposed Action. However, this alternative will involve 137,600 acres of public lands and 185,500 acres of native vegetation and wildlife habitat.

5.7 NO ACTION ALTERNATIVE

The No Action Alternative does not involve any short-term uses of the environment above existing conditions.

SECTION 6 - IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

6.1 PROPOSED ACTION (SILURIAN VALLEY) ALTERNATIVE

Irreversible and irretrievable commitment of resources is the use of those resources by a project on a long-term or permanent basis. Commitment of resources for implementation of the Proposed Action will include using construction materials for over/underpasses of Highway 127 and camera towers, and using fossil fuels for operations. Implementation of the Proposed Action will result in the following irreversible environmental changes:

- Permanent commitment of 331,217 acres of land that will be physically altered by training activities. The open land committed to such a use is unlikely to revert to open space uses.
- The withdrawal of 310,296 acres of public lands administered by the BLM, presently in relatively undisturbed and remote settings, to be used primarily for military purposes would result in changes to the wilderness characteristics of the area. The Proposed Action would change the naturalness, solitude, and recreation characteristics.
- Training activities may result in the major alteration of habitats or disturbance of a localized plant or animal population.
- Construction materials (concrete and steel in particular) for over/underpasses of Highway 127 and camera towers will be irretrievably committed for the life of the project. Use of these materials represents a further depletion of natural resources. Construction and maintenance of these facilities for the Proposed Action are considered a long-term, nonrenewable investment of these resources.
- Fossil fuels and energy will be consumed during construction and operation activities. Fossil fuels (gasoline and diesel oil) will be used to power construction equipment and vehicles. The energy consumed for project construction and operation represents a permanent and nonrenewable commitment of these resources.

6.2 MODIFIED AVAWATZ-SILURIAN ALTERNATIVE

The commitment of resources for the implementation of this alternative will be the same as that for the Proposed Action. However, this alternative will involve 270,030 acres of land, including 253,300 acres of public lands.

6.3 MODIFIED COYOTE BASIN ALTERNATIVE

The commitment of resources for the implementation of this alternative will be the same as that for the Proposed Action. However, this alternative will involve 259,470 acres of land, including 196,914 acres of public lands, and will not require construction of over/underpasses of Highway 127.

6.4 ALVORD ALTERNATIVE

The commitment of resources for the implementation of this alternative will be the same as that for the Proposed Action. However, this alternative will involve 210,800 acres of land, including 168,700 acres of public lands and will not require the construction of over/underpasses of Highway 127.

6.5 SUPERIOR VALLEY ALTERNATIVE

The commitment of resources for the implementation of this alternative will be the same as that for the Proposed Action. However, this alternative will involve 284,885 acres of land, including 202,254 acres of public lands, and will not require the construction of over/underpasses of Highway 127.

6.6 AVAWATZ MOUNTAINS ALTERNATIVE

The commitment of resources for the implementation of this alternative will be the same as that for the Proposed Action. However, this alternative will involve 185,500 acres of land, including 137,600 acres of public lands, and will not require the construction of over/underpasses of Highway 127.

6.7 NO ACTION ALTERNATIVE

This alternative will not require any long-term commitment of resources above existing conditions.

SECTION 7 - CONSULTATION AND COORDINATION

This chapter contains information on the agency and public consultation and coordination activities performed as a part of this EIS. Public participation opportunities, agency consultation opportunities, and the document distribution list are provided.

Under the provisions of NEPA, all who are interested in this process will have an opportunity to review the EIS. The Draft EIS will be distributed to selected public libraries, as well as to various designated agencies and groups as noted on the mailing lists at the end of this chapter. Additionally, a notice of availability will be sent to an expanded mailing list along with a listing of locations where the document can be found. The original mailing lists were compiled with the help of all the cooperating agencies; additional agencies, groups, and individuals were added to the master listing subsequent to the series of public scoping meetings and media announcements.

7.1 PUBLIC PARTICIPATION OPPORTUNITIES

In order to elicit concerns of private citizens, organizations, groups, and federal, state, and local government agencies that might be affected by the proposed withdrawal, a public scoping period was held from August 23 to September 26, 1988. All persons and organizations thought to have a potential interest, including minority, low-income, disadvantaged, and Native American groups, were informed and given the opportunity to participate in the decision-making process. Announcements of this public scoping period were made via the publication of a Notice of Intent to Prepare an EIS and the Notice of Availability of Preplanning Analysis for the Proposed Expansion of Army NTC at Fort Irwin, California, in the Federal Register on August 23, 1988. The Preplanning Analysis for the Proposed Expansion of Army NTC at Fort Irwin, California, was mailed to a wide ranging list of individuals, agencies, and groups on August 23, 1988. On September 1, 1988, the BLM published a news release announcing the public scoping period and listing the dates, times, and places for the six public meetings. Furthermore, a Notice of Intent was sent to the California State Clearing House on August 15, 1988, a request to place the proposed expansion of Fort Irwin on the agenda for the next board meeting was sent to the San Bernardino County Board of Supervisors on August 12, 1988, and a Notice of Proposed Action was sent to a list of individuals and agencies who have requested notification of any studies or actions that could impact WSAs on August 15, 1988. The series of six public scoping meetings were held as follows:

- September 12 - Riverside Holiday Inn - 1 p.m. (press briefing only) and 7 p.m.
- September 13 - San Bernardino County Board of Supervisors - 7 p.m.
- September 14 - Victorville Green Tree Inn - 7 p.m.
- September 15 - Barstow Station Inn - 7 p.m.
- September 22 - Baker Community Hall - 7 p.m.

Each meeting was chaired by a BLM spokesperson, a presentation was made by an Army spokesperson, and consultants responsible for preparation of the EIS were available to listen to public concerns. Approximately 250 people attended the public meetings. About 100 people voiced their concerns at the meetings; several hundred more telephoned or provided written comments to the BLM. Consideration was given to letters and comments received up until the publication of the updated preplanning analysis on November 16, 1988.

Many concerns were raised during this period; most concerned environmental issues (habitat loss, endangered flora and fauna, degradation of air and water quality), private property (loss of actual property, rights of private property owners, adequate compensation), and loss of access to public lands (for various recreation uses, economic benefits, and aesthetic reasons). Public response to scoping, including responses from federal and state agencies, was used to identify additional issues for inclusion in the environmental analysis. A complete scoping

meeting report dated November 1988 prepared by Sharon Clark Associates is on file at BLM's Barstow Resource Area Office.

Further scoping opportunities were provided by the BLM in August 1990 and February 1992. Written comments were solicited during these two scoping periods. No new scoping issues were identified during the additional periods.

Many specific scoping issues were raised, and the significant issues are discussed in detail in the Draft EIS. A listing of these significant or otherwise important issues is provided in Section 1 of this document. Other concerns raised during scoping, which are not found within the Section 1 listing, are discussed in the text of the document or have been dismissed as nonsignificant issues.

Alternatives Should Include Other Military Lands - This concern is addressed in Section 2 under Alternatives Eliminated from Further Analysis.

National Military Actions are Cumulative in Area Impacted and to the National Budget - Data were not available to perform an analysis of the national budget for military actions. The cost of expanding the NTC is currently being determined by the Army to include the costs for land acquisition, operations, and mitigation.

Compensation for Private Lands - This concern is addressed in Section 2 as part of the description of the Army's Proposed Action.

Goldstone - Possible impacts on the National Aeronautics and Space Administration (NASA) Goldstone Deep Space Complex are discussed under the transportation and the health and safety sections herein.

Biodiversity - Biodiversity was not extracted as a separate issue but is addressed under the biological section in Sections 3.5 and 4.5.

Army Commitments to Mitigation and Protection Measures - Several comments were voiced questioning the Army's success in meeting previous environmental commitments and the Army's ability to control tanks to keep them within NTC boundaries. The Army has taken steps to alleviate previous concerns regarding solid waste and hazardous substances (Section 3.20) and has committed to numerous mitigation measures as part of its Proposed Action. Measures to mark potential new boundaries with signs and electronic monitoring of vehicle locations are included.

Limit Expansion to Necessary Lands/Demonstrate Need - The purpose and need for the proposal are discussed in detail in Section 1 of this document. The determination of the expansion study area was developed to meet minimum needs of the Army's assigned training mission (i.e., provide for brigade-level training). Information on the development of alternatives is provided in Section 2.

Relation to the Western Mojave Land Tenure Adjustment (WMLTA) Project - The relationship between the Army's expansion proposal and the WMLTA Project is discussed in Section 3.10.

Relation to the California Desert Protection Act - The relationship between the Army's expansion proposal and the California Desert Protection Act submitted by Senator Feinstein (Senate Bill 21, 1993) is discussed in Section 2.

Valley Fever Potential with Increased Dust - The potential for increased incidence of Valley Fever is discussed briefly as part of the air quality (dust) discussion in Sections 3 and 4.

Elimination or Restriction of Multiple Uses Presently Occurring on Public Lands - Discussion of the effects of the Army's proposal on multiple uses presently occurring on public lands within the study area is located within each resource and land use element in Section 4.

Timing of Analysis - Preparation of this document, in accordance with the NEPA of 1969, considered the time required to obtain data and reach conclusions regarding the potential environmental effects of the action. In addition, public participation opportunities were provided for 30 days during the public scoping period and will be provided for an additional 90 days to allow review of this DEIS.

Access to be Eliminated - Access to areas within and adjacent to the proposed expansion area is addressed in the transportation section of the analysis.

Climate - Information on the climate of the region is provided as background information in the air quality

discussion in Section 3. No significant impacts would be expected to affect climate from the Proposed Action.

Army Need for Future Expansion - The Army's present proposal and purpose and need are discussed in Sections 1 and 2, which include provisions for Army needs in the foreseeable future.

Alternatives for Training Type - Alternatives addressing a change in the type of training provided by the NTC are not addressed in this document. The Army's NTC provides specific training for soldiers and units "as they would expect to fight." Other training methods are used on other Army installations. The NTC is the sole installation where operationally and doctrinally correct areas of land could be made available for this type of training.

Benefits for a Stronger Military - Military benefits to be achieved with expansion are discussed fully in Section 2.

Coordination with Other Agencies - Other agencies contacted during the development of this document are described in this chapter.

Economic Impacts to Land Users - This is discussed under each associated land use. For example, the potential impacts on leaseholders are discussed under the livestock grazing analysis.

Economic Impacts on Communities - This is discussed, as appropriate, under the associated land use. For example, the potential impact to the community from a potential loss of future mineral extraction activities is discussed under the minerals analysis.

Elimination of Manix Area from Expansion Proposal - This became effective on November 16, 1988, and the Manix area is no longer discussed in the analysis.

Elimination of Superior Valley from Expansion Proposal - The Superior Valley area is addressed in detail within the analysis of the Superior Valley Alternative. The Superior Valley area is not a part of the No Action, Modified Coyote Basin, Alvord Mountain, Proposed Action, or Avawatz Alternatives.

Elimination of Alvord Mountain from Expansion Proposal - The No Action Alternative is the only alternative addressed in the document that eliminates the Alvord Mountain area from consideration. All action alternatives include the Alvord Mountain area for acquisition and use by the Army. The proximate location of Alvord Mountain to the existing NTC makes it a critical link in provision of additional maneuver acreage to the existing maneuver corridors.

Pistachio Orchards - This is not specifically addressed in the document. Agricultural information is provided in the land use analysis in Sections 3 and 4. Most of the area containing pistachio plantings has been removed from consideration by the Army due to the elimination of the Manix area as discussed above.

Impacts on Adjacent Private Lands - Residual impacts on private lands remaining adjacent to an expanded NTC are addressed within the following specific analyses: noise, use and occupancy of private lands, and health and safety.

Because the Army's Proposed Action alternative is also a Proposed Plan Amendment, the public is allowed 90 days in which to comment on the Draft EIS and Proposed Plan Amendment. During this period, written comments on the Draft EIS and Proposed Plan Amendment will be accepted and public meetings will also be held.

Written comments should be sent to: Barstow Resource Area, Bureau of Land Management, 150 Coolwater Lane, Barstow, CA 92311, Attn: Mike Dekeyrel. Responses to public comments will be published in the Final EIS, as well as any corrections to the text of the DEIS.

7.2 AGENCY CONSULTATION

Federal agencies that have identified an interest in participating in the EIS process as cooperating agencies include U.S. Department of the Interior, the former Bureau of Mines, and the U.S. Department of the Air Force.

Formal and informal coordination was undertaken between the BLM, NTC, and the following agencies: NASA (Jet Propulsion Laboratory and Goldstone Communications Complex), NAWS, USFWS,

CDFG, and Marine Corps Air Ground Combat Center, Twentynine Palms, CA. In addition, the BLM and NTC met with utilities companies representatives.

The following efforts were made to determine whether a state or local agency was interested or has responsibility to participate in this process under the California Environmental Quality Act (CEQA):

- Notice of Intent to prepare EIS and the preplanning analysis were sent to the State Clearinghouse in accordance with the agreement between the BLM and the State of California.
- Direct mailing of preplanning analysis to the County of San Bernardino and all state agencies that have previously been interested in federal actions in the vicinity of the proposal, including CDFG, SLC, and others.
- Direct mailing of formal invitation to the following agencies to participate as CEQA agency: State Lands Commission, County of San Bernardino, and CDFG.

None of these agencies indicated an interest or a need to participate as CEQA agencies. All state and local agencies on the mailing lists will continue to be notified of environmental analysis events as they continue.

The BLM and the Army have agreed to include the following information in the EIS to meet the requirements of CEQA: discussion of air quality, water quality and availability, and growth-inducing impacts of the proposal.

7.3 DOCUMENT DISTRIBUTION

The following list of public agencies, libraries, and museums will receive a copy of the Draft EIS for review. In addition to this list, many officials, universities, interest groups, and private citizens will also receive a copy for review. All who requested a copy of the Draft EIS during the scoping period and during preparation of the Draft EIS will receive a copy for review. The Draft EIS is a public document.

Libraries

San Bernardino County Library
15001 Wakita Blvd.
Apple Valley, CA 92307

San Bernardino County Library
304 E. Buena Vista
Barstow, CA 92311

Base Library
China Lake NWC
China Lake, CA 93555

BLM Service Center Bldg 50
Library/D-553A
P.O. Box 25047
Denver, CO 80225-0047

Government Documents
LA County Public Library
P.O. Box 7011
Downey, CA 90241-7011

San Bernardino County Library
9565 7th St.
Hesperia, CA 92401

East Base Line Branch
San Bernardino County Library
27167 E. Base Line
Highland, CA 92392

Law Library
Loyola University
1440 W. 9th St.
Los Angeles, CA 90015

LA County Law Library
501 W. First St.
Los Angeles, CA 90012

Resource Library Rm 100A
Cal Poly Pomona
3801 W. Temple Ave.
Pomona, CA 91768

Riverside Main Library
3581 7th St.
Riverside, CA 92501

Government Publications
UC Riverside Library
P.O. Box 5900
Riverside, CA 92517

Sacramento County Law Lib.
720 9th St.
Sacramento, CA 95814

San Bernardino County Library
104 W. 4th St.
San Bernardino, CA 92401

Feldheym Central Lib
San Bernardino Library
555 W. 6th St.
San Bernardino, CA 92410-3001

San Bernardino County Library
15011 Circle Dr.
Victorville, CA 92392

Documents Expediting Project
Library of Congress - Unit X
Congressional Research Service
Washington DC 20540

California Agencies

Gordon Duffy
CA Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

CA Attorney General
3580 Wilshire Blvd. # 800
Los Angeles, CA 90010

CA Energy Commission
1516 9th St.
Sacramento, CA 95825

Mike Guisti
CA Fish & Game Dpt
P.O. Box B-P
Blyth, CA 92225

John Brode -Wldlf Mgt Div
CA Fish & Game Dpt
1416 9th St.
Sacramento, CA 96814

Fred Worthley
CA Fish & Game Dpt
330 Golden Shore #50
Long Beach, CA 90802

Bob Vernoy
CA Fish & Game Dpt
15786 Inyo St.
Victorville, CA 92392

Director
CA Fish & Game Dpt
1416 9th St.
Sacramento, CA 95814

Director
CA Highway Patrol
P.O. Box 942898
Sacramento, CA 94298-0001

CA Highway Patrol
2211 Western Ave.
San Bernardino, CA 92411

Duncan/Herman
CA Mines & Geology Bd
1416 9th St. #1326-A
Sacramento, CA 95814

Director
CA Mines & Geology Div
1416 9th St. Unit 1341
Sacramento, CA 95814

OHV Recreation Div.
CA Parks & Rec. Dpt.
P.O. Box 942896
Sacramento CA 94296-0001

CA Public Utilities Comm.
350 McAllister St.
San Francisco, CA 94102

Van Vleck/Snow
CA Resources Agency
1416 9th St.
Sacramento, CA 95814

Chief Deputy Director
CA State Clearing House
1400 Tenth St. # 121
Sacramento, CA 95814

Director
CA State Hist. Preserv.
P.O. Box 942896
Sacramento, CA 92496-0001

Greg Pelka
CA State Lands Comm.
245 W. Broadway #425
Long Beach, CA 90802-4471

Director, Environmental
CA State Lands Comm.
1807 13th St., Room 101
Sacramento, CA 95814

Division of Water Rights
CA Water Res. Control Bd.
P.O. Box 100
Sacramento, CA 95801

Director
CA Water Resources Dpt.
P.O. Box 942836
Sacramento, CA 94236-0001

District Director
CALTRANS Dst. 8
P.O. Box 231
San Bernardino, CA 92402

Environmental Affairs
CALTRANS
1120 "N" St.
Sacramento, CA 95814

Gerald Thibeault, Ex. Officer
CARWQCB Santa Ana Region
2010 Iowa Ave. #100
Riverside, CA 92507

Regional Clearinghouse
SCAG
818 W. 7th St., 12th Fl.
Los Angeles, CA 90017

Public Information Center
SCAQMD
21865 E. Coplen Dr.
Diamond Bar, CA 91765-4178

Museums

Anthropology Museum
CSU Fullerton
800 N. State College Blvd.
Fullerton, CA 92634

Richard Reynolds
George Page Museum
5801 Wilshire Blvd.
Los Angeles, CA 90036

Southeast Information Center
Imperial Valley Museum
442 Main St.
El Centro, CA 92243

Director
Living Desert Reserve
P.O. Box 1775
Palm Desert, CA 92260

Cliff Walker
Mojave River Valley Museum
P.O. Box 2164
Barstow, CA 92311

Germaine Moon
Mojave River Valley Museum
P.O. Box 1282
Barstow, CA 92312-1282

Director
Natural History Museum
900 Exposition Boulevard
Los Angeles, CA 90007

Director
Maturango Museum
P.O. Box 1776
Ridgecrest, CA 93555

Grant Meyer
Raymond Alf Museum
1175 W. Base Line Rd.
Claremont, CA 91711

Director
San Bernardino Co. Museum
2024 Orange Tree Lane
Redlands, CA 92374

Director
Victor Valley Museum
11873 Apple Valley Rd.
Apple Valley, CA 92308

SECTION 8 - RELATIONSHIP TO RELEVANT ENVIRONMENTAL PROTECTION STATUTES AND OTHER REQUIREMENTS

Consideration of environmental laws, Executive Orders, and other policies in the planning and analysis process is noted below. A summary is provided in Table 8.1-1.

8.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (PL 91-190), AS AMENDED)

This DEIS has been prepared in accordance with the requirements of Section 102 of this Act, and with Council of Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR Parts 1500-1508) and Army Regulation 200-2, Environmental Effects of Army Actions.

8.2 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The BLM, as Lead Agency for the DEIS, has formally requested participation from state and local agencies in this EIS process to act as California Environmental Quality Act (CEQA) agencies. To date, none of the agencies contacted have indicated an interest or a need to participate.

8.3 FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976 (PL 94-579)

This Act directed the BLM to prepare and implement a comprehensive, long-range plan for the management, use, development, and protection of the public lands within the CDCA. This DEIS has taken into consideration the goals and objectives of the CDCA Plan, 1980, as amended. The Proposed Action is not in conformance with the existing CDCA Plan. Therefore, the CDCA Plan would have to be amended as a result of the proposal to expand the NTC.

8.4 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (PL 89-665), AS AMENDED, THE ARCHAEOLOGICAL AND HISTORIC PRESERVATION ACT OF 1974 (PL 93-291), AND EXECUTIVE ORDER 11593, PROTECTION AND ENHANCEMENT OF THE CULTURAL ENVIRONMENT, 16 U.S.C. 470 (MAY 13, 1971)

As required by these Acts and orders, cultural resource literature and record searches were performed by Far Western Anthropological Research Group, Inc. Copies of the report were sent to the State Historic Preservation Officer (SHPO) by the BLM as required by the statewide Programmatic Memorandum of Agreement (PMOA) in effect among the BLM, SHPO, and the Advisory Council on Historic Preservation. Fort Irwin has initiated consultation with the Advisory Council on Historic Preservation as required under Section 106 of the National Historic Preservation Act. A Programmatic Agreement (PA) shall be formulated, and its provisions upon implementation shall serve to mitigate adverse effects of the Proposed Action on historic properties.

8.5 ENDANGERED SPECIES ACT OF 1973 (PL 93-205), AS AMENDED

No federally listed endangered plant species are known or expected to occur in or adjacent to the study area; no impact on any federally listed endangered plant species is expected to occur as a result of any proposed alternative. One plant species found within the potential acquisition areas is expected to be listed by the USFWS in the near future. One federally listed threatened wildlife species, the desert tortoise, is found in varying densities throughout the study area. The Proposed Action incorporates the reasonable and prudent alternative identified in the USFWS Draft Biological Opinion (September 21, 1991). The BLM and the Army have consulted with the USFWS

Table 8.1-1

COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Law or Regulation	Compliance*
National Environmental Policy Act of 1969 (PL 91-190)	Ongoing
Federal Land Policy and Management Act of 1976 (PL 94-579)	Ongoing
National Historic Preservation Act of 1966 (PL 89-665), as Amended	Ongoing
Endangered Species Act of 1973 (PL 93-205), as Amended	Ongoing
Fish and Wildlife Coordination Act of 1958 (PL 85-624), as Amended	**Complete**
Federal Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act	**Complete**
Clean Water Act of 1977 (PL 95-217), as Amended	Ongoing
Executive Order 11988, Floodplain Management (1977)	**Complete**
Executive Order 11990, Protection of Wetlands (1977)	Ongoing
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (February 11, 1994)	Ongoing
Clean Air Act (PL 91-604), as Amended (1990)	Ongoing
Farmland Protection Policy Act (PL 97-98)	Ongoing
U.S. Army Regulation 200-1	Ongoing
U.S. Army Regulation 200-2	Ongoing
Resource Conservation and Recovery Act of 1976 (PL 94-580)	**Complete**
Hazardous and Solid Waste Amendments of 1984 (PL 98-616)	**Complete**
Comprehensive Environmental Response, Compensation, and Liability Act (PL 96-510) as Amended by the Superfund Amendments and Reauthorization Act (PL 99-499)	**Complete**
Toxic Substances Control Act (PL 94-469)	**Complete**
Wild and Scenic Rivers Act (PL 90-542)	**Complete**
Wilderness Act of 1963 (PL 88-577)	Ongoing
National Mineral Policy Act of 1970 (PL 91-631) and National Materials and Mineral Policy, Research, and Development Act of 1980 (PL 96-479)	Ongoing
Compliance with Laws and Regulations Pertinent to Mineral Resources	Ongoing
California Desert Protection Act	Ongoing
Study to Determine Appropriate Minimum Altitude for Aircraft Flying Over National Park System Units (PL 100-91)	Ongoing

* **Complete: Has met all statutory requirements for the Proposed Action.**
Ongoing: Some requirements of the regulations to be met.

pursuant to Section 7 of the Endangered Species Act, and the Proposed Action incorporates the "no jeopardy" USFWS Biological Opinion, dated April 29, 1994. Based on initial analysis, the Proposed Action appears to be compatible with the Final Desert Tortoise Recovery Plan.

8.6 FISH AND WILDLIFE COORDINATION ACT OF 1958 (PL 85-624), AS AMENDED

The project will not impound, divert, or deepen the channel of any stream or other body of water. The project will not otherwise control or modify any stream or body of water as described in 16 USC 662(a). Therefore, a Fish and Wildlife Coordination Act Report is not required for this type of project.

8.7 FEDERAL MIGRATORY BIRD TREATY ACT AND THE BALD AND GOLDEN EAGLE PROTECTION ACT

The Federal Migratory Bird Treaty Act prohibits the taking of migratory birds, their nests, eggs, or parts or products. The Bald and Golden Eagle Protection Act specifically prohibits the taking of bald and golden eagles, alive or dead, or any part, nest or egg thereof. The USFWS recently reclassified the bald eagle from endangered to threatened in the lower 48 states; however, this does not affect the Bald and Golden Eagle Protection Act. The U.S. Army is expected to remain in compliance with these Acts, as the Proposed Action does not involve the taking of migratory birds, bald eagles, or golden eagles.

8.8 CLEAN WATER ACT OF 1977 (PL 95-217), AS AMENDED

Informal consultation with the Regional Water Quality Control Board (RWQCB) has been undertaken with respect to the waste discharge requirements of the Clean Water Act. The circulation of this DEIS for review and comment will represent formal coordination with those agencies charged with implementation of the Act. A separate section 404(b)(1) evaluation of the Clean Water Act was not performed, although all 404(b)(1) criteria were reviewed to determine whether any potential water quality impacts result from the Proposed Action. No dredge or fill activities in waters of the United States or wetlands are required as part of the Proposed Action.

8.9 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT (1977)

Floodplain management includes avoiding development in the floodplains unless it is the only practicable alternative; reducing the hazard and risk associated with floods; minimizing impacts of floods on human safety, health, and welfare; and restoring and preserving the natural and beneficial values of the floodplain. The lack of any structural changes within the study area would ensure that no occupancy or modification of the 100-year floodplain occurs, thereby meeting the objectives of this Executive Order.

8.10 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS (1977)

Wetlands protection includes avoiding to the maximum extent possible long- and short-term adverse impacts associated with the destruction or modification of wetlands and avoiding support of new construction in wetlands. The springs within the study area would be completely avoided by military equipment and personnel. Avoidance of the sensitive spring habitats is being proposed in conjunction with this Executive Order.

8.11 EXECUTIVE ORDER 12898, FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY AND LOW-INCOME POPULATIONS (FEBRUARY 11, 1994)

The purpose of the order is to avoid the disproportionate placement of any adverse environmental, economic, social, or health impacts from federal actions and policies on minority populations and low-income populations.

8.12 CLEAN AIR ACT (PL 91-604), AS AMENDED (1990)

Informal coordination with the Mojave Desert Air Quality Management District (MDAQMD) has been undertaken in conjunction with this Act. A review of existing data from air quality monitoring stations at Barstow and Trona, California, was done to establish ambient air quality conditions for the study area. Existing air quality at the monitoring stations exceeds state and federal air quality standards for ozone and PM-10 (particulate matter with an aerodynamic diameter less than 10 microns). Air quality monitoring was done to determine the amount and type of emissions that will be produced by the Proposed Action. None of the alternatives would contribute to the exceedances of federal standards for ozone, carbon monoxide, nitrogen dioxide, or sulfur dioxide at any monitoring station.

8.13 FARMLAND PROTECTION POLICY ACT (PL 97-98)

The Act specifies that federal facilities and agencies identify the effects of federal programs on the conversion of farmland to nonagricultural uses; consider alternative actions, as appropriate, to lessen any adverse effects; and assume, to the extent practicable, compatibility with state, local government, and private programs and policies to protect farmland. According to San Bernardino County records, 320 acres of farmlands are located within the study area. No prime or unique farmlands or farmland of statewide or local importance are located within the study area.

8.14 ARMY REGULATION 200-1, ENVIRONMENTAL PROTECTION AND ENHANCEMENT

This regulation implements all federal laws concerning environmental noise for U.S. Army activities. These regulations specify that a noise level of 65 to 75 decibels on A-weighted scale (dBA) is normally acceptable in U.S. Army environs. Noise impacts from expanded training exercises were evaluated against these standards and are not expected to be significant.

8.15 U.S. ARMY AUTHORIZATION

Preparation of this DEIS is in accordance with Army Regulation 200-2, *Environmental Effects of Army Actions*, which stipulates that an installation proposal for land acquisition be accompanied by an EIS, and with the NEPA of 1969 (PL 91-90).

8.16 RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA) (PL 94-580) AND ITS AMENDMENT; THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984 (HSWA) (PL 98-616); THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) (PL 96-510), AS AMENDED BY THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) (PL 99-499); AND THE TOXIC SUBSTANCES CONTROL ACT (TSCA) PL 94-469)

The NTC was included on the Hazardous Waste and Substance Sites List (AB) 3750; Hazardous Substance Cleanup Bond Act of 1984 (revised January 1987); Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS); and the underground storage tank (UST) case list for the San Bernardino County region.

8.17 WILD AND SCENIC RIVERS ACT (PL 90-542), AS AMENDED

This Act provides for preservation of certain rivers and their immediate environments that possess outstanding and remarkable scenic, recreational, geologic, fish and wildlife, cultural, or other similar values in free-flowing condition. According to the Nationwide Rivers Inventory (National Park Service [NPS] 1982), no listed wild or scenic rivers or stretches of river under consideration as wild or scenic are located within the study area.

8.18 WILDERNESS ACT OF 1964 (PL 88-577)

This Act was created to define wilderness and establish a National Wilderness Preservation System (NWPS) composed of federally owned areas designated by Congress as "wilderness areas." Any recommendation of an expansion of the NTC to Congress would include a request to eliminate the five wilderness study area (WSA) designations currently in effect in the study area. Unless and until Congress takes action to remove the WSA designation, the U.S. Army will take no action that would result in impairment of wilderness characteristics.

8.19 NATIONAL MINERALS POLICY ACT OF 1970 (PL 91-631) AND NATIONAL MATERIALS AND MINERALS POLICY, RESEARCH, AND DEVELOPMENT ACT OF 1980 (PL 96-479)

These Acts require that agencies of the Executive Branch of Government facilitate and encourage the availability and development of domestic resources to meet critical material needs. It is well recognized that availability of mineral resources is vital to the strategic and economic viability of the nation. Actions that would adversely affect the access to or development of mineral resources are to be fully analyzed through environmental review of a proposal. In order to address the mineral potential of the study area impacted by the withdrawal proposal, the USBOM began an inventory and evaluation of the mineral potential of the area through an agreement with the U.S. Army Corps of Engineers (Corps). This assessment (Phase I) was a preliminary mine model evaluation for selected mineral commodities with reported resource model potential in the study area.

8.20 COMPLIANCE WITH LAWS AND REGULATIONS PERTINENT TO MINERAL RESOURCES

The FLPMA of 1976 (PL 94-579) directs the BLM to inventory mineral resources on public lands and prepare a comprehensive land use management plan. Consistent with Section 102(a) of FLPMA and Section 2 of the National Minerals Policy Act of 1970 (PL 91-631), the CDCA Plan of 1980 states as a goal the recognition of "access to and availability of as much public land as possible for mineral exploration and development." The plan specifically emphasizes lands with potential for "critical mineral resources, energy mineral resources, and mineral resources of local and State importance."

The FLPMA also requires extensive and relatively detailed mineral studies of areas to be withdrawn, including evaluation of future mineral potential and "economic impact of the change in use on individuals, local communities, and the Nation" (Section 204).

Comparably, the EIS process requires discussion and analysis of natural and depletable resources, particularly with regard to the NEPA policy, to avoid or minimize adverse effects of these actions upon the quality of the human environment. Thus, the analysis process must also include analyzing adverse effects on the mineral industry, the nation's mineral supply, and the regional economy (1502.15 and 1500.2[e]).

Locatable minerals subject to the Mining Law of 1872 and potential or productive deposits of leasable and salable minerals on public lands must be evaluated and their importance compared with the needs of the Proposed Action. The USBOM, to the extent possible with the available information, has evaluated the mineral potential of the proposed Fort Irwin acquisition alternatives and addressed the impacts of the Proposed Action on the regional and local economics, the domestic mineral industry, and the strategic needs of the nation.

8.21 CALIFORNIA DESERT PROTECTION ACT

On October 31, 1994, the California Desert Protection Act of 1994 (CDPA) (a portion of Public Law 103-433) was signed into law. The law

- designated 69 wilderness areas and 8 wilderness study areas on public lands administered by the BLM in the CDCA;
- designated three wilderness areas managed by the USFWS on the Havasu and Imperial refuges;
- transferred public lands to the NPS to enlarge Death Valley and Joshua Tree National Monuments and established them as National Parks;

- transferred public lands to the NPS and established a Mojave National Preserve managed by the NPS;
- designated wilderness within portions of Death Valley and Joshua Tree National Parks and the Mojave National Preserve;
- transferred public lands to the State of California at Red Rocks State Park;
- clarified Department of Defense (DOD) withdrawals for the Navy installations in the Chocolate Mountains and China Lakes areas and other policy; and
- provided for consideration of future expansion of the NTC at Fort Irwin.

Five of the designated wilderness study areas are within the area proposed for expansion by the NTC. The specific areas are identified in the law by the following legislative maps:

- Avawatz Mountains Wilderness-Proposed, dated May 1991;
- Kingston Range Wilderness-Proposed 4, dated July 1993;
- Soda Mountains Wilderness-Proposed 1, dated May 1991 and Soda Mountains Wilderness-Proposed 2, dated January 1989;
- South Avawatz Mountains-Proposed, dated May 1991; and
- Death Valley National Park Boundary and Wilderness 17-Proposed, dated July 1993.

Under Section 104 (b) of the CDPA, public lands in these legislative wilderness study areas shall continue to be subject to the requirements of Section 603(c) of the FLPMA, pertaining to the management of wilderness study areas in a manner that does not impair their suitability of such areas for preservation as wilderness. Under Section 104(c) of the FLPMA, all federal lands within these wilderness study areas were withdrawn from all forms of entry, appropriation, or disposal under the public land laws; from location, entry, and patent under the United States mining laws; and from disposition under all laws pertaining to mineral and geothermal leasing, and mineral materials, and all amendments thereto.

8.22 STUDY TO DETERMINE APPROPRIATE MINIMUM ALTITUDE FOR AIRCRAFT FLYING OVER NATIONAL PARK SYSTEM UNITS (PL 100-91), 101 STAT. 674, (1987)

Public Law 100-91 authorized the Secretary of the Interior to study the impacts of overflights by aircraft, including military aircraft, on certain units of our national parks. Although no studies involving the NTC are known to have been conducted to date, the NTC will cooperate with appropriate Department of the Interior officials in undertaking any such studies in the future. Results of any future studies that would affect the NTC will be coordinated with the Department of the Interior, Department of the Army, and the DOD.

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10.1 INFORMATION CONTACTS

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The following technical appendices are part of this application:

Appendix A - Supplemental Information and Exhibits (supplied by HVR)

Appendix B - Geologic Mapping at Hidden Valley, California. Prepared by W.R. Moyle, Jr., California Registered Geologist No. 1233. April 1989.

Appendix C - Seismic Data for the Mojave Desert and Hidden Valley, California. Prepared by W.R. Moyle, Jr., California Registered Geologist No. 1233. February 1989.

Appendix D - Climatic Report for the Mojave Desert and Hidden Valley, California. Prepared by W.R. Moyle, Jr., California Registered Geologist No. 1233. January 1989.

Appendix E - Surface Water Hydrology Investigation, Hidden Valley, California. Prepared by Patrick & Henderson, Inc. (Allan P. Henderson, RCE 25224 and Miller Brian Patrick, RCE 25718). Bakersfield, CA. March 1989.

Appendix F - Benefits of Underground Containment Structures for the Hidden Valley Hazardous Waste Residual Repository Site. Prepared by Patrick & Henderson, Inc. (Allan P. Henderson, RCE 25224 and Miller Brian Patrick, RCE 25718). Bakersfield, CA. March 1989.

Appendix G - Preliminary Design Concepts for Containment Structures, Hidden Valley, California. Prepared by Patrick & Henderson, Inc. (Allan P. Henderson, RCE 25224 and Miller Brain Patrick, RCE 25718). Bakersfield, CA. 1989.

Appendix H - Biota Report and Impact Assessment. Proposed Hidden Valley Hazardous Waste Disposal Facility, San Bernardino County, CA. Prepared by J & M Land Restoration, Inc., Bakersfield, CA. November 1988.

Appendix I - A Cultural Resource Overview for the Proposed Hidden Valley Hazardous Waste Disposal Facility, San Bernardino County, CA. Prepared by Mark Q. Sutton, California State University. CRF-89-6. March 1989.

Appendix J - Waste Treatment Residuals Characterization Study. Prepared by Planning Consultants Research, Santa Monica, CA. February 1989.

Appendix K - A Cultural Resource Inventory for the Proposed Hidden Valley Waste Disposal Facility, San Bernardino, CA. Prepared by Mark Sutton and Robert Parr, California State University. October 1989.

Appendix L - Specified Hazardous Waste Facility, Hidden Valley, CA. Air Quality Impact and Health Effects Environmental Analysis. Technical Report Covering Facilities Construction and Operation. Prepared by Goddard & Goddard Engineering Environmental Studies, Lucerne, CA. September 1989.

Appendix M - Acoustical Assessment Report, Hidden Valley Hazardous Waste Facility, County of San Bernardino. Prepared by Illingworth & Rodkin, Inc., Cardiff By The Sea, CA. July 1989.

Appendix N - Hidden Valley Specified Hazardous Waste Facility Traffic Impact Analysis. Prepared by KHR Associates, Irvine, CA. October 1989.

Appendix O - Gravity Data for the Mojave Desert and Hidden Valley, CA. Prepared by W.R. Mohle, Jr. California Registered Geologist No. 1233. June 1989.

Appendix R - Environmental Reconnaissance of Hidden Valley, California (for HVR owned section). Prepared by W.F. Hardt & Associated, Consulting Geohydrologist, Orange, CA. December 1987.

Appendix S - Site Analysis Report for the Proposed Hidden Valley Resources Residuals Repository. Prepared by Science Applications International Corporation, 1991.

Appendix T - Geotechnical Investigation, Hidden Valley CA. Prepared by Patrick and Henderson, Inc., A. Henderson, Registered Geotechnical Engineer, June 1990.

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SECTION 11 - ACRONYMS AND ABBREVIATIONS

AAQS	ambient air quality standards
AASF	Airforce Aviation Support Facility
ac	alternating current
ACEC	Area of Critical Environmental Concern
ACMI	Aircraft Maneuver Instrumentation
ACR	Armored Cavalry Regiment
AES	AeroVironment Environmental Services
AFB	Air Force Base
AFFTC	Air Force Flight Test Center
AGESII	Air to Ground Engagement System II
AIRFA	American Indian Religious Freedom Act
AMA	American Motorcycle Association
AMP	Allotment Management Plan
ANSI	American National Standards Institute
APCD	Air Pollution Control District
AR	Army Regulation
ASIP	Army Standard Installation Planning
ATSF	Atchison Topeka and Santa Fe
ATV	all-terrain vehicle
AUM	animal unit month
BFM	Brian F. Mooney Associates
bgs	below ground surface
BLM	Bureau of Land Management
BLUFOR	Rotation Training Unit
BOM	U.S. Bureau of Mines
BRAC	Base Realignment and Closure
CAAQS	California Ambient Air Quality Standards
Cal-EPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act of 1988
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDPA	California Desert Protection Act
CDWR	California Department of Water Resources
CEQ	Council of Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society

CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
CORVA	California Off-Road Vehicle Association
CSC	California Species of Special Concern
dB	decibel
dBA	decibels on A-weighted scale
dBP	decibels (peak)
dc	direct current
DEIS	Draft Environmental Impact Statement
DHS	Department of Health Services
DOD	Department of Defense
EA	Environmental Assessment
EBS	Environmental Baseline Study
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMF	electromagnetic field
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ETI	Equestrian Trails, Inc.
EW	electronic warfare
EWTES	Electronic Warfare Threat Environmental Simulation
FAA	Federal Aviation Administration
FCMC	Fort Cady Mineral Corporation
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FFCA	Federal Facility Compliance Agreement
FLPMA	Federal Land Policy and Management Act
FORSCOM	U.S. Army Forces Command
FSOC	Federal Species of Concern
FWARG	Far Western Anthropological Group, Inc.
GAO	Government Accounting Office
GEM	Geology, Energy, and Mineral
H_2S	hydrogen sulfide
HMA	Herd Management Area
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HMP	Habitat Management Plan
HSWA	Hazardous and Solid Waste Amendments
I	Interstate
ICUZ	Installation Compatibility Use Zone
IFR	instrument flight rule
IMPLAN	Name of Economics Software Program
IPA	Intermountain Power Agency
JPL	Jet Propulsion Laboratory
JTREP	Juvenile Tortoise Research Project
km	kilometer
KOP	key observation point
kV	kilovolt

LADWP	Los Angeles Department of Water and Power
Ldn	day/night noise level
Leq	noise equivalent level
LLRW	Low-Level Radioactive Waste
LSA	Logistical Support Areas
LURS	Land Use Requirements Study
m	meter
MATES	Mobile and Training Equipment Sites
MBA	Michael Brandman Associates
MCAGCC	Marine Corps Air Ground Combat Center
MCSS	Mobile Communications Subscriber System
MDAQMD	Mojave Desert Air Quality Management District
MEDDAC	Medical Activity
mgd	million gallons per day
mg/L	milligrams per liter
MILES	multiple integrated laser engagement system
MLRS	Multiple Launch Rocket System
mm	millimeter
MOA	Memorandum of Agreement
MOA	Military Operations Area
MOU	Memorandum of Understanding
mph	miles per hour
MSL	mean sea level
mw	megawatt
NALSA	North American Land Sailing Association
NASA	National Aeronautics and Space Administration
NAWS	Naval Air Weapons Station, China Lake
NEMP	Northern and Eastern Mojave Coordinated Management Plan
NEPA	National Environmental Policy Act
NO_x	nitrogen oxide
NO_2	nitrogen dioxide
NPS	National Park Service
NRHP	National Register of Historic Places
NTC	National Training Center
NWPS	National Wilderness Preservation System
O_3	ozone
OC	Observer Controllers
OEPC	Office of Environmental Policy and Compliance
OHV	off-highway vehicle
OPFOR	Opposing Force Regiment
PA	Programmatic Agreement
PAS	Preliminary Assessment Screening
PL	Public Law
PM-10	particulate matter with an aerodynamic diameter less than 10 microns
PMOA	Programmatic Memorandum of Agreement
POC	point of contact
POL	Petroleum Oil Lubricant

ppm	parts per million
RC	Resource Conservation
RCRA	Resource Conservation and Recovery Act
RESOLVE	Research on Operations Limiting Visual Extinction
ROD	Record of Decision
ROG	reactive organic gas
RSA	Regional Statistical Areas
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SCAB	South Coast Air Basin
SCE	Southern California Edison
SCS	Soil Conservation Service
SEDAB	South East Desert Air Basin
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLC	State Lands Commission
SLRWQCB	State Lahonton Regional Water Quality Control Board
SO_x	sulfer oxide
SR	State Route
STASGO	State Soils Geographic Database
SWAT	Solid Waste Assessment Test
TAA	Tactical Assembly Area
TCP	traditional cultural property
TDS	total dissolved solids
TSCA	Toxic Substance Control Act
TSP	total suspended particulates
ug/m^3	microgram per cubic meter
UPA	unusual plant assemblage
URA	utility risk analysis
URDS	upper respiratory disease syndrome
URTD	upper respiratory tract disease
USAEHA	U.S. Army Environmental Hygiene Agency
USAF	U.S. Air Force
USBOM	U.S. Bureau of Mines
USDOA	U.S. Department of Agriculture
USE	U.S. Ecology
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VER	valid existing right
VFR	visual flight rule
VMT	vehicle miles traveled
VR	visual flight route
VRM	visual resources management
VUD	visitor use day
WMCMP	West Mojave Coordinated Management Plan
WMLTA	Western Mojave Land Tenure Adjustment
WSA	wilderness study area
WSCC	Western System Coordinating Council

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